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EXPERIMENTAL PHYSIOLOGY

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EXPERIMENTAL PHYSIOLOGY

ITS BENEFITS TO MANKIND

WITH AN

ADDRESS ON UNVEILING THE STATUE OF
WILLIAM HARVEY

AT FOLKESTONE, 6TH AUGUST 1881

BY

RICHARD OWEN, C.B., M.D., F.R.S., &c.

FOREIGN ASSOCIATE OF THE INSTITUTE OF FRANCE

'Common sense is of slow growth in a community; but there seems ever to be a floating capital of compassionate credulity, offering a tempting field to the venal knave for raising and garnering a harvest of subscriptions'—LACON



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1882

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MOTIVE.

ON the 28th of March in the present year a Meeting was held at the Royal College of Physicians in London, at which, among others, were present, SIR WILLIAM JENNER, Bart., M.D., F.R.S., in the chair, SIR WILLIAM GULL, Bart., M.D., F.R.S., SIR JAMES PAGET, Bart., F.R.S., and other eminent physicians and surgeons, the object being to 'bring the legitimate influence of the medical profession more effectually to bear on the promotion of those exact researches in Physiology, Pathology, and Therapeutics, which are essential to sound progress in the healing art.'

An Expert in matters of evidence was

present in the person of the Master of the Rolls, who, speaking as one of the outside public, cordially supported the motion for establishing an "Association for the Advancement of Medicine by Research" ; and His Honour remarked 'that it would be most desirable that the public should be informed upon the matters contemplated by the Association.' ¹

To fulfil in some degree this desire is the aim of the present publication.

¹ See Report in *Daily News*, March 29, 1882.

CONTENTS.

	PAGE
1. INTRODUCTION	I
2. ADDRESS	10
3. NOMENCLATURE	51
4. CUVIER	60
5. APPLICATIONS OF VIVISECTION	68
6. ABDOMINAL SURGERY	70
7. ANTISEPTIC TREATMENT	81
8. TOOTHACHE	102
9. FEVERS	105
10. THE PULSE	109, 157, 159
11. NERVOUS DISEASES	111
12. BESTIARIAN REPLIES	127
13. REPUDIATION OF HARVEY	127
14. REPUDIATION OF HUNTER	160
15. NEW MEDICINES AND RELIEF OF SYMPTOMS .	175
16. VIVIPUNCTURE	181
17. USE AND ABUSE OF POISONS	200
18. PROSECUTION OF, AND EXCITEMENTS TO MOB, PHYSIOLOGISTS	211

EXPERIMENTAL PHYSIOLOGY.

1. *Introduction.*—The labours of the 'Commission on the Health of Towns' being completed, and the 'Final Report' sent in (1845),¹ a second 'Commission on the Health of the Metropolis' was appointed (1846), of which I was also a member.

In the course of this duty I inspected and reported on the condition of some of the worst-lodged populations in the most crowded and unsanitary localities of London, of which those in and about Drury Lane and the Seven Dials were types.

In exploring certain courts and alleys it was deemed advisable to be accompanied by a member of the Metropolitan Police. The character and condition of the in-

¹ 'Final Report,' p. 71.

habitants recalled those of the mobs excited in the preceding century by the speeches of the notorious Lord George Gordon. But a redeeming feature was the grateful sense expressed, especially by the poor females, of the kindness and benefits they had received from members of the medical profession who had penetrated to their repellent abodes in charitable applications of healing knowledge. 'You needn't be afraid, sir, of coming amongst us to better our lodgings.'

Daily routes to official duties subsequently led through the above named localities ; and I was one day struck by observing knots of the populace, with whose appearance previous inspections had made me familiar, staring at placards of coarse depictions, in flaring colours, purporting to represent the tortures inflicted by medical experimentalists.

Here was a knot pushing to get a sight of the 'Doctors cutting up your dog alive ;' there, the 'Doctors baking your cat alive ;' in the next street a third placard showed the 'Doctors driving nails into guinea-pigs ;' a fourth, the 'Doctors gouging frogs,' &c.

These mendacious daubs had been placarded in numbers along the worst and most excitable localities of Long Acre, and others to the west of Lincoln's Inn Fields. I was loth to tarry too long lest I might be recognised as one of the class against which the ignorance and brutality of the gazers were so striven to be excited.

The scene forcibly recalled the methods adopted by anonymous scoundrels at the worst periods of Roman history, in order to stir up the passions of their mobs against the early Christians. Caricatures of what were assumed or alleged to take place at the obscure places of Christian devotion and Sacramental fellowship were similarly placarded about the low populous streets of Rome, and the passions so excited issued in the cry of 'Christians to the lions,' with consequent scenes in the Amphitheatre, and were gratified by Nero's 'vivicremations.'

If the persons of the best known and ablest of metropolitan physicians and surgeons had been mobbed, and their residences sacked, the aims of the anti-vivisectional

placarders would have been fulfilled, and the scenes of the Gordon Riots repeated. The subventioners of the artists and bill-stickers may have been encouraged by that precedent.

Such aim, however, failed ; and chiefly through the grateful memory amongst the women, wives and mothers, of the comfort and relief afforded in their repulsive abodes by the libelled healers.

I was not, at that period, cognisant of the outcry endeavoured to be raised against the vivisectional methods of advancing physiological science with consequent augmentation of the powers of recognising and treating the 'ills that flesh is heir to.' I had ceased to practice ; but, as a practitioner, I was conscious of many weak points in medical knowledge. Subsequent exclusive devotion to more purely scientific work, and, in the Hunterian Museum, to physiology, had impressed me with the paramount necessity of such experiments as Harvey and Hunter had had recourse to when face to face with vital phenomena and problems otherwise incomprehensible and insoluble.

It was with grief and astonishment, therefore, that I learnt the decision of the Legislature, amounting almost to prohibition of vivisection, based upon the Report of a Commission, the evidence before which, with comments by eminent professionals, bore chiefly, if not exclusively, on allegations of Continental vivisections which no Act of our own Parliament could reach.

With, if possible, greater pain and surprise, I read the following 'Report' :—

'The Vivisection of Animals.—The annual meeting of the Victoria Street Society for the Protection of Animals from Vivisection was held on Saturday afternoon, by invitation of Lord Coleridge and Miss Coleridge, at his Lordship's residence, No. 1 Sussex Square, Hyde Park, the attendance being numerous. Among those present were Lord Talbot de Malahide, Cardinal Manning, Lord Mount-Temple, Mr. Lewis Morris, General Colin Mackenzie, Mr., R. H. Hutton, Sir J. E. Eardley-Wilmot, M.P., Mr. R. Reid, M.P., and Miss Frances Power Cobbe. The Chair was taken by the Earl of Shaftesbury, who, in opening the proceedings, congratulated the audience that the Society had made considerable progress in establishing in the minds and hearts of men a conviction that the *inhuman system* of vivi-

section was not necessary for the *purposes of science*.—Mr. Charles Adams, Secretary of the Society, in presenting the Annual Report, spoke of the progress of the Society, as shown in the fact that in the first six months of the present year three times as many petitions had been presented to Parliament as in any single year before. He also stated that the finances of the Society were in a satisfactory condition, and, in alluding to the publication, under the auspices of the Society, of the periodical called *The Zoöphilist*, spoke of the great service it rendered in showing that *vivisection pandered to curiosity without doing anything for science*.—Cardinal Manning, in moving the adoption of the Report, said he wished to renew his previous declaration that he would do his utmost towards putting an end to what he believed to be a *detestable practice, not attended with scientific results*. They had been hoodwinked by the legislation on that subject, and believing that it had produced no effect, he maintained that what they should now contend for was the *total abolition of the practice of vivisection*. While the torments of animals were real, the benefits to humanity were altogether conjectural. In concluding, he observed that the Oxford Union Debating Society had passed an anti-vivisection resolution by a large majority.—Sir J. E. Eardley-Wilmot, M.P., who has charge of the Bill in the House of Commons on behalf of the Society, stated that the object of it is the total abolition of the practice of vivisection in this

country.—The Report having been adopted, Dr. Gimson moved: "That vivisection is a scientific blunder and a moral offence, and ought to be totally abolished."—Dr. Berdoe seconded the resolution, which was adopted.—Lord Coleridge, who was warmly received, moved a resolution that the meeting cordially adopted Sir Eardley-Wilmot's Bill for the total abolition of vivisection. His lordship deprecated the use of exaggerated language in speaking of opponents of the Society, and expressed a hope that many eminent men among them would be converted through the exercise of tolerance and patience. On the other hand, he advised the friends of the Society not to be influenced by the application to their views of such expressions as "sentimental" and "effeminate," and ridiculed the idea that a monopoly of manliness could be consistently claimed by those who defended cruelty to dumb animals.—The resolution having been seconded by General Grant on behalf of the Scottish Anti-vivisection Society, and supported by Professor Sheldon Amos, was adopted, and the proceedings terminated with votes of thanks to Lord Shaftesbury and Lord Coleridge.¹

The year 1878 being the three-hundredth Anniversary of the birth of William Harvey, discoverer of the 'circulation of the blood,' and

¹ *Daily News*, June 27, 1881, and *The Times*, June 28, 1881.

inductive investigator of the 'generation of animals,' a meeting was convened by the Mayor of Folkestone, Harvey's native place, for the purpose of discussing the propriety of raising a fund for the due celebration of that Anniversary. A resolution was passed to the effect that the Memorial should take the form of a Statue, to be erected on 'The Leas,' a promenade which is one of the chief attractions of that sea-side town.

But the funds collected were not sufficient to carry it out; and subsequently the aim of that meeting was adopted by metropolitan and other appreciators of Harvey's methods and discoveries, including professors and cultivators of physiological science, members of the medical and surgical professions, together with the governing bodies of the Royal Colleges of Physicians and Surgeons. The subscriptions received by this accessory association, in addition to those of the original one, for a Harvey Memorial Fund, sufficed in 1881 to carry out the design; and at a meeting of the subscribers held at the Royal College of

Physicians, June 29, 1881, Sir George Burrows, Bart., M.D., in the chair, it was unanimously resolved: 'That the Statue of Harvey, completed by the sculptor, Mr. Bruce Joy, be presented to the Mayor and Corporation of the Borough of Folkestone, as the elected representatives of the borough, and be preserved by them in honour of the memory of their immortal townsman.' At the same meeting it was resolved: 'That Professor Owen, M.D., C.B., be invited to unveil the Statue at Folkestone, and to make such presentation in behalf of the subscribers.'

As the seventh Session of the 'International Medical Congress' was decreed to be held in London in August 1881, it was deemed to be a suitable occasion for the ceremony.

I travelled with many members of the 'Congress,' by a special train, liberally provided by the South-Eastern Railway Company, to the locality of the Statue. It was unveiled amidst the cheers of the assembled inhabitants of Folkestone and its

vicinity, and formally presented to the Mayor and Corporation, as the elected representatives of the ancient borough.

The outdoor scene, with a keen sea-breeze blowing, led me to condense my matter and to exclude some topics which are now restored to the 'Address.' It then proceeded :—

2. *Address.*—In the present phase of certain public manifestations of feeling toward labours resulting in, and essential to, the discovery of the circulation of the blood, it is of importance to find, as the list of donations to this Memorial testifies, that, besides the names of our own eminent practitioners of medicine and surgery, teachers and advancers of the science of physiology, and those of European renown, represented by a Pasteur and a Virchow, who personally have taken part in the 'International Medical Congress,' and many of whom I now see around me,—various learned and scientific bodies and intellectual individuals, of all classes, have combined and concurred in testifying that the methods and results of Harvey's discovery have not only

laid the foundation of all progress in physiology, but have been the basis of modern scientific medicine and surgery, and, consequently, the source of countless blessings to suffering humanity. Judging by my own feelings, no testimony or expression appreciative of labours contributing to the advancement of science and to human welfare, would be more grateful to myself than such as might be vouchsafed in connection with my native town.

If we may be permitted to believe that the shade of Harvey is cognisant of the reception accorded to his great discovery, and its appreciation by posterity, none can be, with greater satisfaction, so spiritually discerned, than the Statue now unveiled, to perpetuate his memory, in the place of his birth.

Harvey's grounds for such consideration from successors in his divine profession, from cultivators of physiological science, and from his townsfolk, as well as his claims to the endless gratitude of the human race, have been so fully and so frequently set forth by

greater masters in medical and physiological science than myself, that my duties on this occasion are reduced to easy dimensions ; and any attempt of mine to follow in the steps of Harveian orators must reflect more credit on myself, in relation to the honour of being selected to address you on this memorable occasion, than it can add aught to the appreciation of the labours of the subject of this noble work of British art.

One extrinsic benefit I cannot but think must flow from its presence here, and its contemplation by the ingenuous youth of Folkestone. The elementary education which William Harvey received at his Grammar School was such as many of the sons of your townsfolk start with in that of this ancient borough—especially those who may aspire to life-work in the medical profession. To them I would crave leave to remark that at the present day there is no need, as in 1597, to migrate to foreign universities for instruction in the special sciences of anatomy and physiology ; and in whatever metropolitan hospital and medical

school a young Folkestonian may be matriculated, he can have no better example to follow than that of his townsman Harvey, who listened in his youth to the demonstrations of Fabricius at Padua, and profitably pondered upon the structures displayed in an Italian anatomical theatre.

Labour then, my young friends who may now listen to me ; strive diligently to digest all that may be taught ; endeavour to comprehend the meaning of what you see ; and subject the explanations which your instructors may offer to independent reflection and judgment ; above all, cultivate the manual arts of unravelling organic structures in the dead subject, and in perfecting your skill in exposing the parts which must be seen or experimented on in the lower living animals, to yield the needed knowledge of their actions and functions. For bearing in mind that Harvey in his day had earned, and justly earned, the title of 'Father of Vivisection,'¹ why should there not arise

¹ 'A Master of Vivisection.' Tollin, *Die Entdeckung*, &c., p. 340.

another Native of Folkestone to gain immortality by conferring inestimable benefits on his fellow-man through physiological discoveries, made by like methods of interrogating Nature, and by equal devotion of manual skill, directed by keen insight and sound judgment ?

It is true there are phenomena patent to the eye without need of either dissection or vivisection, suggestive of possible work in the vital machine, and stimulating the application of such manual dexterity in proof of their signification.

Contemplate the course of superficial or subcutaneous veins. If you press the blood, as I now do, at the back of my hand downwards, or, as we say, 'distad,' towards the fingers, you empty such venous tract a certain way, and the blood does not follow the pressing digit ; the vein remains empty, at least for a short time. On removing the pressure it is instantly filled from the finger upwards, or proximad. You may repeat this easy experiment a hundred times, and at any hour of the twenty-four, and the course of the

refilling blood is ever the same—from the fingers to the wrist. It is due to the presence of valves in the veins. Harvey gives diagrams illustrative of these experiments, from which he inferred the use of the valves which his master had described. Consecutive ponderings compelled him to the steps for ascertaining the mode of action of the several parts of the heart's mechanism, and of the correlated channels of the blood.

One naturally wonders that Fabricius was not led on to procedures essential to an anticipation of his pupil's great discovery ; and such sentiment is only abated by experience of the narcotic effect on the mind of a generally and reverently received dogma. The same remark applies to the older anatomist, Sylvius, who had also taken note of some of these folds of the lining membrane of the veins. But neither of them, viewing the parts in the flaccid dead subject, believed them to close the area of the returning channel so effectually as to prevent the blood moving in any other direction save one.

Even Cesalpino, to whom some of his

countrymen have endeavoured to transfer the glory earned by Harvey, could not extricate himself from the accepted doctrine that 'the heart and its vessels served to distribute to the body its vital spirits and native heat, rather than such blood as is found in the veins. Therefore, he concluded that Fabricius's valves could not act absolutely as such.'¹

There is a difference between arterial and venous blood, and our knowledge of its nature and cause rests upon the experiments and discoveries of fellow-labourers in another science—that of chemistry.

Division of labour is an important condition of the advance of knowledge in every field of the phenomena of nature. Most discoveries in physiology, like that of Harvey's, have been suggested or started by previous gains in anatomy.

The lower animals which supplied Galen with so great a proportion of his subjects did, some of them, exhibit what his notions of the

¹ 'Non cogimur membranas vasorum educentium claudere in cordis, venarumque dilatatione.'

work of the heart and its conduits required, viz., intercommunicating channels between the right and left ventricles. Sylvius announced, and Vesalius demonstrated, about the same time (1537), the absence of such intercommunications. The septum or party-wall between the two ventricles they found, in man, to be complete. But the inference to which free cogitation might have led these great anthropotomists was hidden from them by the pre-conviction of the to-and-fro course of the vital and heat-giving currents. If the septum seemed entire, yet it was porous.

Vesalius knew, as an anatomist, that one great vessel carried the contents of the right ventricle to the lungs ; and that another great vessel brought vital spirit back to the left ventricle by the medium of its auricle : the one was his 'Vena arterialis,' the other his 'Arteria venalis.' He knew also the valvular structures connected with each. A pupil of Vesalius, or junior fellow-student of anatomy, named Michael Servetus, drew from these structures the right conclusions as to the anatomical relations of those great valve-

endowed vessels ; in a way and degree closely analogous to the deductions as to the office of the valves of the veins, drawn by the English pupil of the chief discoverer of those parts.

‘The vital spirits,’ writes Servetus, ‘have their origin in the left ventricle of the heart, the lungs greatly aiding in their generation, which is also due to the power of heat ; this subtle spirit is of a yellow colour, is a bright vapour from, as it were, a purer blood, its substance containing the three elements of “water,” “air,” and “fire.” It is engendered in the lungs by admixture of the inspired air with the subtle blood which the right ventricle of the heart communicates to the left. But this communication does not take place, as is commonly supposed, through the septum (*parietem medium*) of the heart ; but by a great artifice, from the right ventricle, by a long course through the lungs, a subtle blood is agitated, is prepared by the lungs, is ejected yellow (*flavus ejicitur*), and is transferred from the vena arteriosa (our “pulmonary artery”) to the arteria venosa (our “pulmonary vein”) ; then, in the arteria venosa itself, it is mixed with the inspired air, which is purged by expiration of its smoke (*à fuligine*), and so at length is drawn in by the diastole, a fit supplement to the making of the “spiritus vitalis.”’¹

¹ ‘Vitalis spiritus in sinistro cordis ventriculi suam originem habet, juvantibus maxime pulmonibus ad ipsius

As to the way of intercommunication of the pulmonary artery with the pulmonary vein, Servetus rightly teaches it to be by the

'various conjunctions and communications of the "vena arteriosa" with the "arteria venosa" in the lungs. The large vena arteriosa is by no means confined to the mere nutrition of the lungs, nor does it bring from the heart itself the power or virtue of the "purest blood;" and besides, before this time, the lungs of the foetus are otherwise nourished.'¹

But here the approach to Harvey's discovery is arrested. Servetus knows or says nothing of the force or power by which the blood is propelled into the pulmonary artery; he knows nothing of the cardiac muscles and their way of operation in this transit of blood from the

generationem. Est spiritus tenuis, coloris vi elaboratus, flavo colore, ignea potentia, ut sit quasi ex puriore sanguine lucens vapor, substantiam in se continens aquæ, aeris, et ignis,' &c.

¹ 'Quod ita per pulmones fiat communicatio et præparatio, docet conjunctio varia et communicatio venæ arteriosæ cum arteriâ venosâ in pulmonibus. Confirmat hoc magnitudo insignis venæ arteriosæ: quæ nec talis nec tanta facta esset, nec tantam a corde ipso vim purissimi sanguinis in pulmones emitteret, ob solum eorum nutrimentum; nec cor pulmonibus hac ratione serviret, cum præsertim antea in embryone solerent pulmones ipsi aliunde nutriri, ob membranulas illas seu valvulas usque ad horam nativitatis nondum apertas.'

right to the left ventricle. This ventricle still sucks in the purified 'spiritus vitalis' by dilating, as the bellows draw in their air; and he is mainly or more directly concerned, throughout this digression into his anatomy, in illustrating by supposed analogies the predominant subject and idea of his, to him, fatal Essay on the Trinity.

Galen's dictum that the blood—what we call the 'venous blood'—takes its origin in, or is formed by, the liver, is here held as unconditionally as by all the contemporaries of Harvey, some of whom contended for its truth and died in that belief.

Servetus sums up by affirming that the first nutrient fluid is 'blood' situated in the liver and the veins of the body; the second is the 'vital spirit' whose seat is in the heart and the arteries of the body; the third is the 'animal spirit,' as it were a ray of light, whose seat is in the brain and nerves of the body.¹

¹ '*Primus* ergo est "sanguis," cujus sedes in hepate et corporis venis: *Secundus* est "spiritus vitalis," cujus sedes est in corde et corporis arteriis: *Tertius* est "spiritus animalis," quasi lucis radius, cujus sedes est in cerebro et corporis nervis.'

When, in current histories of Physiological Science, Servetus is said to have anticipated Harvey in the discovery of the 'lesser' or 'pulmonic' circulation, a modern reader might associate with the anatomical fact, rightly discerned and defended by Servetus, all the physiological relations of that fact which Harvey's vivisections had demonstrated. More especially the way in which, and the structures and actions by which, the venous blood of the body was brought to the right side of the heart and propelled by the systole or contraction of the right ventricle into the 'arteria venosa;' and, more especially, how the same blood, having undergone the respiratory change, was brought by the 'vena arteriosa' into the left ventricle, and distributed by the contraction or 'systole' of that ventricle, through the arteries of the body.

The record by Servetus, in his *Christianismi Restitutio*, 8vo. 1553, of his anatomical explanation of what is now termed the 'lesser circulation,' was unknown to physiology for more than a century after the printing of that

work. The confirmation of the anatomical facts and the exposition of their vital relations became a possession in human knowledge by Harvey's independent researches in connection with that of the true nature and way of work of the whole cardio-vascular system—heart, veins, arteries of every part of the human frame—not merely the 'circulation of the blood,' but of its two-fold circulation, and this not by a new or different interpretation of structure but by visible demonstrations of function.

With respect to the *Christianismi Restitutio* of 1553, it cannot be shown that more than four or five copies of the book ever left the bales in which the whole impression was packed, and which Calvin contrived to get transferred from the printer, and caused to be burnt in the same fire with their author. One copy was taken out for the use of the Inquisitor; another was sent, for their inspection, to the 'Swiss Council;' a third was given by Calvin to his lawyer Colladon, by way of 'brief,' with the theological passages underscored on which Servetus was finally

arraigned and condemned. Calvin did his utmost to prevent anyone, save himself and his accomplices in the murder, from knowing what Servetus had actually written. Harvey never saw a copy, nor knew the anatomical observations which the accomplished physician had consigned in his Theological Dissertation. The power of research and of original observation which they reveal indicates the advances which Servetus might have made had he concentrated his intellectual energies on physiological research; but at that period vivisection was represented by another indoctrinating method exclusively theological.

Not, indeed, until 1694, nearly a century and a half after the abominable vivicremation of the author, was the existence of any copy of the work made known to the Republic of Letters, which is indebted for this knowledge to Sir Henry Wotton, in his *Reflections on Learning, Ancient and Modern* (1694).¹ The copy in question bears the name of

¹ See the admirable work entitled *Servetus and Calvin*, by Dr. Robert Willis, 8vo.

Colladon. An early reprint is now in the British Museum, where I had the pleasure and privilege of showing it to the assembled Continental physicians who did me the honour to accompany me, yesterday, through the halls and galleries of the building at Bloomsbury.

William Harvey returned from his studies in Italy to London in the year 1604. The anatomical preparations which he brought from Padua and presented to the College of Physicians, together with the social position of his mercantile brothers, ensured him a favourable estimation of his abilities and opened for him a promising career in practice. At what date Harvey may have put Fabricius' hypothesis to the test, and first essayed, independently, to comprehend the motions of the heart, and to make out the meaning of these motions and the structures relating thereto from dissections of living animals, is conjectural. The earliest indication which has been found of his experimental procedures and their illustrations of his public teachings of the motions of the heart and blood is a 'note' of the subject of his lectures

as Lumleian Professor at the College of Physicians in the year 1615.

Harvey started on his voyage of discovery with the anatomical observations of Vesalius on the 'valves of the heart,' and with those of Sylvius and Fabricius on the 'valves of the veins.'

But, 'How worked, how moved the heart?' These were problems to be solved. It is not enough to be yourself convinced of a theory which you have been led to originate. To yield its due results, and confer its benefits on your fellow-men, you must give them demonstrative—palpable and visible—proofs of your discovery. And the more counter your discovery—no longer mere statement or hypothesis—runs to the then accepted views, the more incumbent becomes it, on the part of the discoverer, to demonstrate his proofs. And Harvey did not shrink from such obligation. He was a truly religious man; charitable and compassionate as such. He felt his deep responsibility for the gifts he had received from the Fountain of all Knowledge. He

could not but be conscious of the rarity and value of such entrusted talent; he shrunk from the sin of 'hiding it under a bushel.' Accordingly, he laid bare the heart in a living animal; he showed his hearers and watchers that, in the act of propelling the blood, it contracted, became notably shorter and narrower, erected itself, as it were, and so gave the 'beat' which we feel upon the chest and onward. That this 'beat,' or 'pulse,'¹ was due to the 'systole' of the heart, not, as was then taught, to an action of the artery itself, in connection with a 'diastole' or expansion of the heart. Grasped by the hand, the heart was felt to be a firm body; the action was plainly that of a muscle, such as was required to expel a dense fluid, not a mere spiritual one, as was the then accepted doctrine. Furthermore, the relaxation of the heart was shown and seen to be the passive state of the organ, yielding and expanding to extraneous forces driving in the blood, not sucking in, as by a blacksmith's

¹ No reward could have been meted to the searcher more acceptable than this by the Author of all Truth.

bellows, a hypothetical subtle entity. Next, Harvey showed, in the heart of a living animal, that there were two distinct motions—one of the auricles, another of the ventricles—these succeeding each other rhythmically; and, when the point of the ventricle was cut off, blood, not ‘aërial spirit,’ was seen to spurt therefrom. Moreover, the blood so experimentally expelled from the left ventricle was visibly florid, or arterial, while that from the right ventricle was black, or venous. The great vein terminating in the left auricle was shown to carry thither ‘arterial blood;’ those terminating in the right auricle were shown to deliver to it ‘venous blood.’ The simultaneously contracting auricles were seen to empty their respective kinds of blood into their respective ventricles; and these, next contracting, and simultaneously, were seen to expel their respective contents, by the pulmonary artery to the lungs, by the aorta to the entire body.¹

¹ *Exercitatio Anatomica de motu cordis et sanguinis in animalibus*, 12mo, Franco furti, 1628.

It was absolutely essential to the discovery, to the demonstration and consequent reception and fruition, of the Harveian doctrine of the circulation, that the discoverer should have satisfied himself, by vivisection, of the facts; and that contemporary physiologists and physicians should be brought to witness those demonstrations. Of their absolute necessity, we have the proof in the surprise which the vivisectional results occasioned in the physiological world, and in the visible plain demonstrations they opposed to the controversial opponents, who strove to make themselves and others regard the ideas of the Harveian circulation of the blood and of the heart's actions therein as absurdities and condemnable innovations on orthodox doctrine.

Such objections compelled the great discoverer to repeat, to vary, and to extend his experiments. 'If a live snake,' he writes, 'be laid open, the heart will be seen pulsating for an hour or more, contracting and propelling its contents, becoming of a paler colour in the systole when it empties itself, of a sanguineous hue in the diastole when it is

filled. . . . In this animal,' Harvey proceeds to say, 'the vena cava enters the heart at its lower part, and the aorta leaves it at the upper part. Now if the vein be taken between the finger and thumb, or seized by the dissecting forceps a little way below the heart, and the incoming current of blood be thereby arrested, you will see the part which intervenes between the obstruction and the heart fall empty, and the heart itself become smaller and of a paler colour, and beat more slowly. But the impediment to the flow of blood being removed, instantly the colour, the size, and the motion of the heart are restored.'

I must ask pardon for trespassing on your time, especially of my professional friends and fellow-labourers, with these to them well-known quotations. My excuse is the 'Report of the Annual Meeting of the Society for the Protection of Animals from Vivisection,' published in the 'Times' newspaper of June 28, and in the 'Daily News' of June 27 of the present year. This document, issued in the names of estimable men, including some eminent in divinity and in law, threatens Parliamentary prohibition of experi-

ments such as those which have given new powers to the physician and surgeon, and to which Harvey refers in the introduction to his immortal work—" *Non ex Libris, sed ex Dissectionibus* "—by which term he meant or included the experiments which the Legislature is now asked to totally prevent.

In reply to such appeal to Parliament, I beg respectfully to remark that to almost every objection to his conclusions, Harvey responded by some vivisectional demonstration, modified as to subject and method, in order to test such objection. Harvey was conscious that his discovery would give the physician the power to form a truer diagnosis of disease, and consequently a more efficient and successful treatment. That such was the influence of the new doctrine of the circulation on the current medical practice of the day, is shown by the opposition it met from all the older established metropolitan practitioners, whose excuses for non-acceptance took the form of misstatements to ignorant but influential patients, and had the result of injuriously affecting and diminishing the medical practice of Dr. Harvey himself.

How congenial to the feelings, the interests, the wishes of these older doctors in London would have been the alliance of noble lords, church dignitaries, and learned judges of that day, whose influence with the administrative powers might have prevailed to prohibit the physiologist from making any one of the experiments on which he relied for his own convictions, and those of his disciples, as to the real actions and functions of the heart, of the tracts traversed respectively by the venous and arterial currents, and not merely of the circulation, but of the twofold courses of the blood ! Suppose an anti-vivisectional clamour to have then, as now, besieged the Legislature ! Fortunately for Harvey and medical science, Lord Chancellor Bacon, a contemporary of the physiologist, had truer views of the methods of advancing knowledge than have been manifested by some of his successors on the 'Bench' of lower grade. Such clamour would have met with no encouragement, in 1628, from the author of the *Novum Organum*.

In the Medical School established by

Ptolemy in Alexandria, not only the anatomy of the dead human body, but of the living subject was practised, and 'the inhumanity of anatomia vivorum was by Celsus justly reproved.' But hereupon Bacon remarks: 'Yet in regard of the great use of this observation, the inquiry needed not by him so slightly to have been relinquished altogether, or referred to the casual practice of surgery, but might well have been diverted upon the dissection of beasts alive, which, notwithstanding the dissimilitude of their parts, may sufficiently satisfy this inquiry.'¹

The true humanitarian, rejecting more emphatically than Bacon the usage of the living criminal, which Celsus reproved, had adopted the alternative recommended before the Chancellor's suggestion.

Both William Gilbert² and William Harvey practised before Bacon preached the inductive methods of augmenting knowledge.

¹ *Advancement of Learning*, fol. ed. 1753. Bacon's *Works*, vol. i. p. 57.

² *De magnete, magneticisque corporibus, &c., et argumentis et experimentis demonstrata*, 1600.

Both were 'physicians,' and the latter pursued the experimental method in express relation to increasing his power as a healer.

This leads me to trespass a little longer on your attention, and to refer to the next great advance in the knowledge of the actions and properties of the circulating system, with the same blessed result to humanity.

The discovery in question, which, as conferring a power to cure disease, I am disposed to regard as second only to Harvey's, was that made by John Hunter, in 1780, of the property of the arterial capillaries to enlarge under what he figuratively termed the 'stimulus of necessity.'

Suppose, for example, a Cardinal, a Bishop, a learned Judge, or an Earl of the last century, to have been afflicted with an aneurism at the bend of the leg; groaning with a tumour in the ham of the size of a child's head; such tumour pulsating, pressing on the surrounding tissues, the bones, gristles, and nerves; occasioning inflammation and absorption of those parts, accompanied by unintermitting agonising pain, only to be allayed

by lethal doses of opium or other deadly narcotic, and threatening imminent dissolution by a bursting of the thinned and inflamed skin. Aneurisms are not extremely rare afflictions. Prior to Hunter's discovery, supplementing Harvey's, the ablest medical authorities could only have assured the noble, right reverend, and learned patients, that the ordinary surgical remedy, excision of the tumour, was, as a rule, fatal. True, about that date, an able surgeon of St. Bartholomew's Hospital, Mr. Pott, had suggested amputation of the thigh, which somewhat diminished the chances of a fatal result ; and this was held to be a great advance in the treatment of the aneurism in question, and was, as a rule, submitted to. In what frame of mind would the wretched sufferer have listened to a statement that, through knowledge acquired by vivisectional experiment, his agony would be relieved, his limb preserved, his malady cured ?

Our modern bestiarrians know not what they do, or say, nor care they, as it seems, what benefits to suffering humanity they would

obstruct or prevent. They are unconscious of the mistaken ground selected for unfurling their flag of a superior sensibility, are dumb in regard to the much more extensive and fitting fields for active interposition in favour of the lower creation, and in defence of poor animals from tortures inflicted on them by men who have no aims beyond their own gratification and what they miscall 'sport.'

To the slow sufferings of the wounded pheasant, escaping from the gunner and his dogs, dyeing with its trickling blood the verdure of the close covert in which its life ebbs painfully away—to this they seem indifferent. For the poor hare or rabbit which has had its jaw broken by an ill-aimed shot and escapes, they care not : they know nothing of the consequences of the healing of the wanton injury. The chisel-teeth have been violently and painfully put out of gear ; their law of perpetual growth is no longer controlled by mutual apposition and attrition ; the essential instruments for cropping food have been mutilated for man's pleasure, and slow death from starvation is the consequence. When a keeper comes by chance

on the emaciated body of such dead and starved hare or rabbit, the curiosity of the tusk-like incisors is offered to an anatomical museum.

But even these inhumanities, inseparable from sport, are scarce comparable to the agonies of the prolonged chase, when fox or stag are ultimately torn by the howling four-footed fiends hounded on by biped masters.

Do bestiarrians hold 'annual meetings for the protection of animals from'—tor-
tures inflicted year by year, and by thousands of inflictors for sport only? No! Their sensibilities are solaced at the expense of the blessings to humanity due to a Harvey and a Hunter; they feel no shame in deceiving the public by such assertions as that 'the inhuman system of vivisection was not necessary for the purposes of science.'¹

Are they so ignorant of, or do they wilfully shut their ears and eyes to, the dangerous and painful vivisectional experiment which is performed daily, throughout the

¹ Report of the annual meeting, etc., *Daily News*, June 27, 1881.

three kingdoms, on thousands of our most valued domestic creatures—an operation, not only cruel in itself and never performed under anæsthetics, but attended with a more cruel consequence should the writhing subject survive the mutilation—its deprivation, viz., of the highest pleasure permitted to its brute nature? This ‘detestable practice is not attended’—nor meant to be—‘by any scientific results.’¹ A noble quadruped is tortured that it may serve, with less trouble to the owner, as a beast of draught or burthen. Other kinds are subjected to the vivisection in order to add to the luxury of the table.²

As to the acts which have the alleviation of human sufferings for their sole aim, I need not enlarge on the manifold evidences known

¹ Cardinal Manning, in the ‘Report,’ etc., *ante*, p. 6.

² I confess that exposition of the hypocrisy of those who select for blame but one of the conditions or aims of vivisection the lower animals has mainly led me to denounce shooters, hunters, slaughtermen, castrators, and anglers. It is cowardly to clamour for legislative interference, exclusively, with the much fewer number of men, weaker in social influence, but superior in beneficence of aim, perhaps in heart and mind, who experiment in order to gain further insight into a science on which the relief of disease and repair of injury essentially depend.

to my medical and physiological hearers, as justifying the terms in which I have referred to the denunciation of such skilled experimenters as the immortal subject of this day's inauguration.

The relation thereto of Hunter's discovery of the property of the capillary blood-vessels to enlarge, under conditions which have made the cure of aneurism in a great proportion of cases sure and painless, cannot be veiled from cognisance. John Hunter, it is true, may not have been thinking of such result when, pursuing the Baconian method for the advancement of physiological science, he applied it to the elucidation of the singular phenomena of the annual growth and shedding of the antlers of deer.

He had the permission of a gracious Sovereign to make his vivisections on those denizens of Richmond Park. When Harvey, there, demonstrated to his Sovereign that the arteries carried blood as well as the veins, and both these in definite directions, such an operation as Hunter proceeded to perform became conceivable in relation to his aim, and

by his skilful hands practicable, without affecting the health or life of the animal. Whatever benefit to suffering humanity has been derived from Hunter's experiment, the vivisections of Harvey guiding thereto must come in for their share of the gratitude of humanitarians.

So guided, the course of Hunter's physiological reasoning led him to put a ligature round the artery supplying the growing antler. The pulsations of the vessels of the formative 'velvet'¹ ceased, and soon the antler began to cool. The buck was released and bounded away. About a week after this vivisection, Hunter revisited the park. The animal was caught, and to the experimenter's surprise the vessels of the antler were again pulsating, the velvet had recovered its warmth, the growth was proceeding as usual. Hunter, thereupon, ordered the buck to be killed (scores are

¹ The name given by the 'keepers' to the finely villous soft covering of the growing antler conveying and protecting the vessels supplying the material of growth. This ended, the 'velvet' dries, shrivels, and is rubbed off by the fully 'attired' buck. See the Preparations, Nos. 163-168, *Physiological Series*, Hunterian Collection, in the Museum of the Royal College of Surgeons.

hunted and slain annually for venison). He injected the arterial system, thinking he might have been mistaken in the vessel he had tied. No! The canal of the carotid was obliterated. But sundry, and ordinarily minute branches sent off below, or on the heart's side of the ligature, had enlarged, and had carried the blood to other capillaries communicating with the carotid above the ligature, and the enlargement of these previously inconspicuous vessels had restored the supply to the cold antler, and reintegrated the power of growth. 'And what scientific result,' might ask a member of the 'Victoria Street Society,' 'could attend so detestable a practice'¹—such 'vivisectional pandering to curiosity'?² The result was a power of relieving an enormous amount of human suffering and untimely death.

At Hunter's Hospital—St. George's—

¹ Report, in *Daily News*, *ante*, p. 6. Such are the terms in which a dignitary of the 'Church,' whose history does not reveal sympathy for human torture and violent death in torments, permitted himself to allude to an indispensable instrument of advance in the healing art.

² *Ib.* Paid secretary of the 'Society for the Protection,' &c.

cases of popliteal aneurism were not uncommon. The sufferers were usually coachmen of the rich, subject to the pressure of the hard margin of the box-seat upon the vessels of the ham.

Now, Hunter, turning over in his mind the phenomena he had observed and caused in vivisecting the deer, thought thus : ‘ Suppose, instead of amputating the man’s limb, I were to cut down and tie the femoral artery at some distance from the diseased part so as to diminish the risk of hæmorrhage, such as attends the meddling with the unsound artery near the tumour. It might stop the flow of blood into the aneurismal sac long enough, at least, to allow the blood there to coagulate and form a natural plug ; and, if the human capillaries should behave like the cervine’s, the man’s leg may become nourished independently of the popliteal channel.’

Accordingly, Hunter said to his groaning patient, who had previously consented to the happily not performed amputation—and there was no anæsthetic then in use : ‘ My good man, if you will let me make a small cut in your

thigh, it is possible I may save your life and your limb.' 'God bless you, sir,' said the sufferer; 'do what you think best, so you put me soon out of this torment.' Hunter explained to his assistant and the surrounding pupils the results which he hoped and believed would follow a repetition on his patient of the vivisectional experiment on the deer. No sooner was the strong current of blood checked by the ligation of the femoral artery than the tumour ceased to beat and began to diminish. The patient exclaimed with joy, that the agony in the ham was gone. It is true, the leg, like the antler, began to part with its vital warmth. 'Don't apply any artificial heat; simply swathe the foot and leg in flannels,' were the vivisectionist's directions. In twenty-four hours the natural warmth began to return; not so the pulsations of the tumour; this morbid mass went on decreasing. In six weeks the coachman walked out of the hospital on both legs, cured of his aneurism.¹ Surgery

¹ An account of Mr. Hunter's method of performing the operation for the cure of the Popliteal Aneurism is given in *Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge*, vol. i. 1793, p. 147.

became possessed of a new and beneficent power, for which it now had sure physiological grounds. Subsequent mechanical improvements have led to obliteration of the aneurismal artery by pressure ; and the comparatively trifling operation which Hunter substituted for the rarely successful amputation recommended by Pott is now less frequently resorted to, pressure being substituted for ligature.

Many whom I now address may recall accounts of the punishment, of old, inflicted on brawlers within the precincts of 'the Court,' the amputation, viz., of the hand committing the assault, by the mallet and chisel, and the application by the hangman of the red-hot iron to stop the jet of blood.

Such, however, was the mode of arresting hæmorrhage on amputation of a limb, by surgeons of every country in which their science and practice had reached that mutilating method of dealing with disease and of treating wounds. To the groans on the cutting and the sawing parts of the operation add the irrepressible shriek on the application of the fire to the bare hissing stump !

Will the bestiarian, denying the need of experiments to prove the circulation of the blood and the expanding property of the microscopic capillaries, condescend to call to mind and picture to himself or herself the thousands of suffering fellow-creatures in every civilised nation, blessed by competent healers and charitable hospitals of the periods, who underwent the torture of the actual cautery, *plus* the knife and saw !

What form of humanity shall we call it that would prevent by Legislative Enactment and prohibitory punishments the experiments on a dog or a deer indispensable to justify the substitution of a ligature for a red-hot instrument in the case of a poor sufferer whose life might be preserved and health restored at the cost of an arm or leg, amputated by a skilful practitioner, guided by the advanced physiological science of his day ? Though subscribers to the ' Victoria Street Society ' be ignorant of them, healers well know the ineffectual endeavours to do away with the old tortures of amputations by tying the divided artery instead of burning it with the contiguous

flesh. And why ineffectual? Because such vivisections as taught Hunter the properties of the several coats of the living artery,¹ and, at a later period, those performed on dogs and horses by Dr. Jones, were indispensable as guides to better practice. Those experiments demonstrated that the well-meant application of the broad tape-ligatures, suggested under the idea of doing no injury to any of the arterial coats, was the very condition that led to the subsequent sloughing and hæmorrhage, and compelled a return to the safer and surer cautery by the conservative surgeons of the day. Hunter knew that a ligature which would divide the innermost coat of the artery, but not the outermost receiving the pressure, would cause a process of inflammation, which his vivisectional experiments had led him to call 'adhesive,'² and which would conduce to obliteration of the blood-vessel without the lethal consequences of the squeezing of it by the tape.

The humanitarian results are, that, of

¹ *Trans. of Soc. for Improvement of Med. and Chir. Knowledge*, vol. i. p. 150.

² *On the Blood, Inflammation and Gun-shot Wounds*, 4to 1794, ch. iii.

the numbers of our own species who, in every nation where scientific surgery is applied to their relief, submit to amputation, their local agony, instead of being aggravated by the red-hot iron, is mitigated and terminated by the application of the slender silken or catgut or 'tendon' ligature. The flaps covering the stump being readjusted, healing by the 'first intention,' or the adhesive inflammation, has been substituted for the sloughing of the flesh burnt by the actual cautery.

Such are the results—and other instances might be multiplied—of vivisectional experiment, yielding, besides the light thrown on the physiological problem suggesting and requiring the experiment, unexpected guiding power to the truly humane men who devote themselves to the alleviation of the sufferings of their fellow-creatures. And note that the 'tender-hearted,' who set no bounds to the abusive epithets by which they assail and endeavour to arrest such beneficent work, and howl down the inflicter of a slight wound on a single deer, have no remonstrances in favour of the hundreds of the dappled herds which undergo the terrors of the chase,

the wounds of the stalker's bullet, and the cutting of the throat, to supply the appetite and please the palate of the gourmand.

In view of the Society's Bill for the Total Abolition of Vivisection, which was down for second reading in the House of Commons on July 13,¹ I would remark :—Suppose a Parliament of George II. had listened to a forbear of the honourable Baronet in charge of that Bill, advocating the total abolition of vivisection in the terms quoted below ; and that 'the House,' without going the extreme length recommended, had decreed that 'no experiment on a living animal should be legal without the express permission of the Secretary of State for the Home Department, and under impedimental restrictions.'

John Hunter, at a period when he was known to society only as a rising young surgeon, amusing himself with making an anatomical museum, finds himself compelled to go to Downing Street to obtain the requisite

¹ Report, etc., *Times* for June 28, 1881. The fuller Report, in the *Daily News* of June 27, gives the terms of the adopted motion : 'That vivisection is a scientific blunder and a moral offence, and ought to be totally abolished,' *ante*, p. 7.

‘licence’ to solve the physiological problem then monopolising his cogitations. We may suppose the following colloquy to ensue :—

Home Minister : ‘What is the object, Mr. Hunter, of your proposed experiment on the living deer?’

Vivisector : ‘I want to know how their horns grow.’

H. M. : ‘And what do you propose to do to gratify that desire?’

Viv. : ‘For one thing, I propose to cut down upon the carotid artery, and tie it.’

H. M. : ‘And what good do you expect to get by inflicting on an unfortunate animal that degree of pain?’

Viv. : ‘I have nothing further in view, sir, than what I have stated.’

H. M. : ‘And so you would pander to your curiosity in regard to the growth of its horns by subjecting a poor deer to your detestable operation! I can give no sanction to such inhuman vivisection, of which you are unable to foresee any scientific results in relation to your own professional purposes and practice.’

The discomfited physiologist departs :

and mankind continue to die of a tormenting malady, sometimes with, sometimes without, the added operation of amputation at the thigh, actual cautery inclusive !

Under the ' Act of Parliament ' which the Legislature has lately been persuaded to pass,¹ John Hunter would have been summoned to ' Bow Street,' if he had omitted to apply for the ' licence ' to advance physiology by experiments ; or if, after its refusal, he had presumed to cut down upon the carotid artery of the deer ; or to exercise his unrivalled anatomical skill in dissecting off the outer and the middle tunics, in order to determine their respective powers of resistance, and the consequent special property of the inner one. Moreover, if he had not made the deer insensible before the experiment, or if he had not killed it after the experiment, instead of waiting for a result which has been so pregnant in diminution of human tortures, he would, upon conviction, have been subject to the penalty of 50*l.* for each experiment.

' Licence,' as it is probable, having

¹ 39 & 40 of Queen Victoria, chap. 77.

been refused by the Minister, that blessed experiment could not have been performed ; or, if 'licence' had been granted, the hampering terms of the ' Act of Parliament ' would most probably have fulfilled the inhuman intentions of a ' Bestiarian Society.'

Mr. Mayor, and Gentlemen, my time, as my fellow-labourers are pleased to recognise, is pretty well occupied, and in the present year more closely and pressingly than usual. It is only a worker who knows the value of time ; and this has led me, in acceding to the request which has brought me before you, to ponder in what way and degree I might turn the occasion to most profit. To have made my Address simply laudatory of its great subject ; to have dilated on Harvey's experiments and observations in elucidation of the mysteries of generation, for example, resulting in an enunciation of a law now beginning to be accepted, that every living thing has come from the germ, which Harvey calls 'egg,' of an antecedent living thing (*omne vivum ab ovo*)—such treatment would but have been an inferior reproduction of countless

previous orations. Therefore it seemed to me to be not only germane to the memory of the great vivisector, but also a duty on whomsoever may strive to follow in his steps, especially with the threatened appeal to the Legislature to totally prohibit such experiments as those to which mankind are indebted for Harvey's and Hunter's great discoveries, to exemplify by such instances as the time permitted the way and degree in which vivisection imparts the power of diminishing and removing the sufferings of our fellow-men.

In conclusion, I beg, in the name of my fellow-labourers in the promotion of the sciences of healing who have availed themselves of the facilities of travelling from London to Folkestone afforded by the South-Eastern Railway Company, to express their grateful and respectful acknowledgments to the Chairman and Directors of that company for the special train so kindly and liberally provided for the occasion.

3. *Nomenclature*.—Since the delivery of the foregoing 'Address,' publications have

appeared by members and officials of the 'Society for the Protection of Animals from Vivisection,' which have impressed me with a sense of obligation to submit some of the 'additional instances' glanced at in that 'Address' of the benefits which have accrued to humanity from the methods of gaining insight into the modes of action and healing processes of parts and organs of the animal frame. I can truly assure the 'Society' and its supporters by speech, pen and purse, that a term, to which some have objected, was used in my 'Address' simply as best expressing their aims in behoof of beasts as opposed to those as exclusively held in behoof of our own species.

And I would ask a calm and unprejudiced consideration to the following statement.

A chief business of the naturalist is the determination of the specific character of his subject; and, if new, to make the name of the species expressive of such character.

Practice in this work led me to consider the 'names' distinctive of 'kinds' in common discourse. Take, for example, the 'working

'class': the term is still applied to one species only of workers; and, as Milton long ago expressed (page 114), by no means to that which does the hardest kind of work. Its inadequacy is indicated by its synonyms; for example, 'labouring population,' 'humbler classes,' 'poorer classes,' 'operatives,' 'artisans,' etc.; the last term rightly indicating a 'sub-species,' those 'working men,' namely, who get their bread by a higher kind of manual labour than the rest.

Pondering, zoologically, on this difficulty, it appeared to me that a truer specific character was exemplified by the way in which 'working men,' truly so called, were paid for their work:—The true and unself-seeking statesman by the gratitude of his countrymen and the veneration of future ages; lawyers and doctors by *fees*; merchants and trades-folk by *profits*; clerks and other officials by *salaries*; manual labourers by *wages*.

I was therefore led to substitute the term 'wage-class' for 'working-class,' in my 'Address' to the 'British Association for the

Advancement of Science' at the 'meeting' held at Leeds, in 1858.¹ The term has been accepted by good authorities : by the chief of sanitarians, Edwin Chadwick, who acknowledged its source, and, subsequently, by John Stuart Mill. Occasionally, also, a 'Daily Journalist' has since referred to the 'wage-earning class.' But the genius of our Saxon idiom is manifested by conciseness—is economical of syllables. The historian, recording the victories of Cressy and Agincourt, does not laud the victors as British 'bow-bearing men,' but simply as 'bowmen': so, 'wage-class,' 'wage-folk,' 'wage-people.'

True it is, they don't like it : the wrong *nomen specificum* leaves an impression that they do all the labour of the community worth speaking of. I would not recommend any one, seeking their 'voices' to address them as 'wagemen,' or to imply that other classes took their share in the world's work.

In dealing with my present subject, as naturalist and physiologist, I felt a similar difficulty. What are the true specific

¹ 'Presidential Address,' 8vo., p. 50, and 'Note.'

characters of the kinds of the community therein concerned? The plainest outcome seemed to be, that, of those civilised folk who are not wrapt up in self, some act, speak, and write for the benefit of man-kind, others in behoof of beast-kind.

The terms 'humanist,' 'humanitarian,' in our best dictionaries (Latham's 'Johnson,' e.g.) express, in degrees, the first kind—have no reference whatever to the second; in theology 'humanitarian' has a restricted meaning, but affects not the wider application.

In the Harveian 'Address,' and what will follow, 'humanitarian' signifies those whose acts, speech, writing, relate to the good of human beings. There is, so far as I can find, no correlative term applicable to, or designative of, the class who work, speak, write, subscribe, and prosecute their kind, in behoof of brute-beasts. The correct specific term of such should be based on *bestia* (Lat. beast), as that of the contrasted species is based on *homo* (Lat. man).

I therefore avail myself of the advantage of signifying the second group to which my

present work relates by the word 'bestiarian ;' not in any degree intending it as a term of reproach, but as suggested by one sympathising with, and desirous of being helpful in, their aims, so far as they do not harm the human species of animals.

I had also in view the same advantage which led me to propose single 'substantive terms' in place of 'descriptive phrases' for parts of animal bodies previously known by the latter only, whereby an economy of words and exactitude in comparisons was gained.¹

Thus, the 'Victoria Street Society for the Protection of Animals from Vivisection' may be, not only briefly, but more correctly, designated the 'Bestiarian Society': more correctly, because in its 'Animals' are not included those of the human kind; they, on the contrary, have been rather 'protected' from the means essential to the diminution of the sufferings from maladies far more numerous, varied, and acute, than those of the lower

¹ *On the Archetype and Homologies of the Vertebrate Skeleton*, 8vo., 1848, p. 2.

kinds of animals.¹ But that arises from abuse of true bestiarism, and is a temporary, probably well-meaning, hallucination. Between these two classes of the unselfish proportion of civilised beings exists, or ought to exist, mutual

¹ The presumed literary attainments of editors might lead one to expect them to give a name to the medium of their lucubrations, in derivative harmony with their express and exclusive object. If this be to arrest the progress of the Healing art as applied to human kind, in so far as that progress depends on experiments on living brutes, they should remember that they and the physiologists they hate and persecute belong to the 'τὰ ξῶα,' whilst the species they exclusively protect are the 'τὰ θηρία.' Of the class '*Animalia*' of Linnæus the first genus is '*Homo*,' mankind.

Nor would the name of 'theriophilist' be beyond cavil so long as, in relation to the daily sustenance of themselves and their kind, the 'Journal' should offer no protest against the skull-smashing, throat-cutting treatments of poor beasts; or, in view of occasional luxuries, its editor should raise no voice against the 'skinning alive' (when partaking of stewed eels) and 'boiling alive' (when adding the lobster-sauce to the turbot; or when picking the sapid shrimp at breakfast, or indulging in winkles). But even in its restricted crusade against such milder operations as are exemplified in Harvey's, Hunter's, Spencer Wells's, and Joseph Lister's experiments, if the 'Journal' must flaunt a classical epithet, the name above suggested is the one to which it is correctly entitled.

A better and truer name for the periodical 'published under the auspices of the Victoria Street Society' would be *The Bestiarian*. Of other weekly advocates of the total suppression of experimental physiology, a journal which won't look at any but the worst side of vivisection calls itself *The Spectator*.

respect, each for each. Humanitarians look to bestiarists for aid and guidance in every endeavour to augment the power and means of mitigating human sufferings and of arresting lethal maladies. In the experimental methods essential to those ends, bestiarists confide in their being conducted by humanitarians on the following principles:— that no beast be subject to an experiment which merely shows what has already been received as thereby demonstrated; and that every vivisection be made on a narcotised beast, save where anæsthetics would stultify the result. Some bestiarists prefer the prohibitive stultification.

Here is repeated a part of the protest which, as a 'bestiarist,' I long ago recorded:— 'I reprobate the performance of experiments on living creatures, to show to students what such experiments have taught the master; whilst the arguments for learning to experiment on living animals are as futile as those for so learning to operate surgically.' It is by comparative anatomy, by displaying the organs in dead beasts, or amputating in

the dead subject, that the art is acquired of operating on living ones when the good of mankind calls for surgery, or for the light afforded by experimental physiology.

After the 'Reports' of the 'Commissions' for the 'Health of Towns,' and that of the 'Metropolis' had appeared, a third 'Commission' was issued on the subject of the meat-supply of London. Of that also I was a member, and, as a 'bestiarian,' exerted myself to the utmost to abate the needless accessory sufferings to which the cattle required for carnivorous London were subject, often goaded to madness when driven through the metropolitan thoroughfares to the then intramural places of sale and of slaughter. The 'Recommendation for Abolition of Smithfield' was carried; but, in regard to that for extramural slaughterhouses, my friend the Right Hon. George Cornwall Lewis and I were in a minority. The City was represented on the 'Commission,' and interests in favour of Newgate Market prevailed; so the poor beasts continue to be driven to that and other slaughter-

houses in Newport Market, Clare Market, and such-like densely populated localities, to undergo their final fate at the hands of the butchers.

4. *Cuvier*.—In comparison with the physical and chemical sciences which depend for their advancement on experiment, Cuvier affirms that it is not so with physiology; and the reasons he assigns are that—‘all the parts of a living body are connected (*liées*); that they can only act so long as they act all together; that to separate one from the mass is to relegate the whole to the order of dead substances, it is to totally change its essence. The machines, he continues, which constitute the object of our (anatomists) researches cannot be detached (*démontées*) without being destroyed; we cannot know what would result by the absence of one or more of the works (*rouages*), and consequently we cannot know what is the part which each of the works takes in the total effect.

Fortunately for experimental physiology, a part of a living organism detached from the

rest of the machine does not become a 'dead substance' all at once.

The nerve of which Charles Bell detached the root from its vital connections with the spinal cord lived and acted long enough to teach him that it played the part of 'feeler' in the machine; another nerve, similarly severed, lived and acted long enough to teach him that it energised as a 'mover' of the machine.

The head of a decapitated tortoise or turtle continues alive long enough to afford all the requisite proofs of the parts which cerebrum, cerebellum, medulla oblongata, this and the other nerve, and their respective portions, as in the 'trigeminal' nerve, play in the vital mechanism of the living whole.

The cerebrum and cerebellum being removed from a living frog, the animal long continues alive and seemingly conscious, drawing its limbs up under it, moving them all harmoniously. But when it is decapitated, and the medulla oblongata severed from the rest of the machine, though the body responds by movements to the irritation of the skin, the

limbs cease to move harmoniously, although responding to partial stimulus.

In short, the gains to physiology made by Whit, Gilbert Blane, and Marshall Hall, resulting in the knowledge of the 'reflex function,' superadded to the functions of volition and true sensation, have all been obtained by the same methods by which chemistry and physics have been advanced, and stand in complete refutation of Cuvier's idea of the consequence of meddling with, or pulling to pieces, parts of the organic machinery.

As to the teachings of functions by observing the more or less of parts in organs, or by comparative anatomy alone, I need only refer to the fact that all the modifications of the heart, as shown in beast, bird, snake, and fish, were as well known to Harvey's predecessors as to himself. He applied extensive researches in comparative anatomy to aid him in the resolution of his great problem, and may have been the discoverer of the still more simplified conditions of the heart in the lobster, shrimp, and hornet. But all these, seen in the dead body,

gave not to Harvey the knowledge he wanted. It gave him one of the steps to it: how to display them, and watch their movements, and see what manner of fluids their mechanism had been made to distribute.

Not one of his predecessors got an idea of the circulation by gazing at the single auricle and single ventricle in a dead fish, or at the single ventricle and double auricle in a dead snake, or at the double ventricle and double auricle in a dog or deer. Still less did they, or could they, know its function by looking at a dorsal vessel in a dead insect or crustacean,

Vivisection was the key that opened the physiological treasure-house whence Harvey deduced the means of gaining insight into the nature and treatment of manifold diseases, whereby thousands in his day, and millions of his fellow-creatures, truly so-called, have since his day had reasons to bless his name, and so will continue to the end of time.

This is the result in which the Humanitarian exults with every friend of his species at every other series of vivisectional dis-

coveries, giving corresponding powers to the skilled healer.

No! Cuvier, in the opening Discourse of his Lectures on Comparative Anatomy, yielded to an irreflective eloquence in setting forth the superiority of his science.

A garbled extract of this Discourse, mistranslated, has been put forth by one of the advocates for the total prohibition of Harvey's method of advancing physiology;¹ and must be my excuse for offering what contemporary comparative anatomists may regard as common-place remarks; which, moreover, if I were a mere 'osteologist,' I might have shrunk from propounding. I subjoin, therefore, the text of my great master in biology.²

¹ *Plea for Mercy to Animals*, 8vo. (no date).

² 'La physiologie doit nécessairement suivre la même marche que toutes celles des sciences physiques que l'obscurité et la complication des phénomènes n'ont point encore permis de soumettre au calcul;—' mais la physiologie n'a pas pour cet effet le même avantage que les sciences qui opèrent sur les substances non organiques, que la chimie et la physique expérimentale, par exemple. Celles-ci peuvent réduire à une simplicité presque indéfinie les problèmes qu'elles se proposent; elles peuvent isoler les substances dont elles veulent reconnaître les rapports et la nature, et les combiner ou

Of the 'Pleader for Mercy's' notion of any obligation for mercy to fellow-men, some idea may be formed by his reduction of

les rapprocher successivement de toutes les autres. Il n'en est pas de même de la physiologie. Toutes les parties d'un corps vivant sont liées; elles ne peuvent agir qu'autant qu'elles agissent toutes ensemble: vouloir en séparer une de la masse, c'est la reporter dans l'ordre des substances mortes, c'est en changer entièrement l'essence. Les machines qui font l'objet de nos recherches ne peuvent être démontées sans être détruites; nous ne pouvons connaître ce qui résulterait de l'absence d'un ou de plusieurs de leurs rouages, et par conséquent nous ne pouvons savoir quelle est la part que chacun de ces rouages prend à l'effet total.

'Heureusement la nature semble nous avoir préparé elle-même des moyens de suppléer à cette impossibilité de faire certaines expériences sur les corps vivants. Elle nous présente dans les différentes classes d'animaux presque toutes les combinaisons possibles d'organes; elle nous les montre réunis, deux à deux, trois à trois, et dans toutes les proportions; il n'en est, pour ainsi dire, aucune dont elle n'ait privé quelque classe ou quelque genre; et il suffit de bien examiner les effets produits par ces réunions, et ceux qui résultent de ces privations, pour en déduire des conclusions très vraisemblables sur la nature et l'usage de chaque organe et de chaque forme d'organe.

'On peut observer la même marche, pour déterminer l'usage des diverses parties d'un organe, et pour reconnaître celles qui sont essentielles et les distinguer de celles qui ne sont qu'accessoiries. Il suffit de suivre cet organe dans toutes les classes qui l'ont reçu, et d'examiner quelles sont les parties qui s'y trouvent toujours, et quel changement opère, dans les fonctions relatives à cet organe, l'absence de celles qui manquent dans certaines classes.'

I quote from the Preliminary Discourse in the form of the

Harvey's merits and labours to the following level. He quotes :—

‘I remember,’ says Mr. Boyle, ‘that when I asked our famous Harvey, in the only discourse I had with him (which was but a little while before he died), what were the things which induced him to think of a circulation of the blood, he answered me, that when he took notice that the valves in the veins of so many parts of the body were so placed that they gave free passage to the blood the contrary way, he was invited to think that so provident a cause as Nature had not placed so many valves without a design; and no design seemed more probable than that, since the blood could not, because of the interposing valves, be sent by the veins to the limbs, it should be sent through the arteries, and return through the veins whose valves did not oppose the course that way.’

On which recollection of a conversation the following statement is based :—‘Here we have the testimony of Harvey himself that he was led to the discovery by anatomical

‘Lettre à J. C. Mertrud,’ which is given, word for word, as it appears in the first edition of the *Leçons*, issued in 1799 (An. viii.), and repeated in the last, viz. the *Leçons d'Anatomie comparée de Georges Cuvier*, 8vo. ed. 1835, tome premier, p. xvi.

observation, and inference therefrom. Experiments were afterwards made in proof of what he had discovered'¹—such experiments being nowise necessary or essential to the discovery, in the reiterated statements of the advocates for the 'total abolition' of such. The writer in question goes on to assert that Harvey 'generalised the previous observations of Fabricius, Cesalpino, and others, and so demonstrated the main points of the system.'²

On grave questions of this kind, affecting the weal of humanity, an upright judge would place the words of the speaker above the hearsay recorded by one drawing from memory after the speaker's demise. Fortunately Harvey still speaks, and will do so for all time. The equal and honest seeker after truth would go to the fountain head. And, in regard to the quoted scrap of gossip, I must say that it does not harmonise with the reverential allusions to the great First Cause pervading the physiologist's own account of

¹ *Plea for Mercy to Animals*, p. 78.

² *Ib.* p. 79.

the motives and the consequent successive steps which Harvey made, and found essential to establish his discovery, and render it operative with his professional brethren.

But to the weak and ignorant whom this depreciator addresses it was essential that he should so define the work, which he misquotes as a 'Treatise on the Motion of the Heart,' as to support the taunt that 'the extravagant way in which it is spoken of could not be exceeded if (to borrow the words of Archbishop Whately) Harvey had made the blood to circulate instead of merely describing the process.'¹

The time, let us hope, is not far off when the antagonism between theology and science may cease.

5. *Applications of Vivisection.*—As long ago as the year 1500 Buchanan illustrates the subject of his work, 'De jure Regni apud Scotos,' by the remark, 'The physician must know the laws of Nature before he can apply them.' The nature of such knowledge essential to true and successful practice, was

¹ *Plea for Mercy*, &c., p. 79.

that of living things, '*animalia*,' of which **both** man-kind and beast-kind are parts and **members**.

Physiology, and the powers it gives the **practitioner** in the cure and relief of injury and **disease**, is no more stationary, not nearer its **ultimate** attainments, than the sciences which **have** gifted humanity with present powers of **locomotion** by sea and land, with means of '**lightening** our darkness,' of swiftly communicating thoughts and facts to distant **communities** and friends both by writing **and** word of mouth, and which seems now **to be** replacing steam and gas by further **applications** of electric force.

If the science of the workings of the **organic** machinery is to keep pace with those that set in operative motion the inorganic forces, the ruling powers of a civilised community would do well to pause before obstructing and preventing the experiments indispensable to the progress of physiology, and should shrink from degrading the gifted students of the science as if their operations essential to that progress were a crime.

I proceed, therefore, to submit to the consideration of legislators and of unprejudiced members of the educated classes a few more examples of the fruits of vivisection now enjoyed and, through appreciated ample experience, acted upon by the ablest members of the medical and surgical professions throughout the civilised world.

6. *Abdominal Surgery*.—Prior to the year 1860 operations involving removal of abdominal tumours, or viscera, or morbid parts of such, were usually fatal, were resorted to only in extremest cases, or for some brief postponement of imminent dissolution.

The main condition of fatality was the ‘peritoneal inflammation,’ a consequence of laying open the abdominal cavity. The removal of a tumour of any kind from that cavity, with exceptional success, was a surgical feat exciting wonder, and rarely sanctioned by the notabilities enjoying large practice.

The main condition of a gain of power in relief of such painful growths and agonising conditions was a physiological knowledge of the properties and processes of healing of

the several tissues composing the parietes of the cavity to be cut open.

A practitioner of the physiological school of Harvey and Hunter, whose line of practice had brought him much experience of intra-abdominal tumours, entered upon the philosophical and truly humane track of investigation essential to the gain of the needed knowledge and power. A bestiarian might suggest that he should have tried conceivable modifications of the surgical treatment upon a succession of patients; and, after the loss of a given proportion, he might so have gained the light sought for, in such series of human vivisections, without 'tormenting the brute.' The undertaking operations on women with this view, now that the results of the knowledge aimed at are known, might, even, be deemed excusable by one whose age precluded liability to such maladies. Prior, however, to entering on any course of research leading to operative innovations, success in 'ovarian cases' had been as rare as in 'aneurismal tumours' before the time of Hunter.

Happily for humanity, Thomas Spencer

Wells adopted the Hunterian way of discovery. He sacrificed, instead of patients, a few dogs, rabbits, and guinea-pigs. Dr. Benjamin Ward Richardson gave his aid in narcotising the subjects of the experiments. The material evidences, as in the example of Hunter, are shown in the preparations now preserved in the museum of the Royal College of Surgeons, of London.

The results rewarded the philosophical investigator. They demonstrated that the conditions of healing of the outer skin of the belly-wall were not those of the inner skin ; that not to meddle with the peritoneum after incision, as previously taught and practised, was the condition of danger, not of safety ; that methods of successfully uniting the cut edges of this inner skin, learnt from his vivisections, were more essential to the success of the operation than the pins and twisted sutures previously applied to effectually close the wound of the outer skin. These vivisections taught the all-important but unsuspected fact, that, although when skin is divided the cut edges must be brought together to secure

direct union, the exact opposite holds good with serous membranes : surfaces not margins must be co-adjusted.

Non-medical individuals might be expected to give its due value to the grateful acceptance by the most competent practitioners of all countries to the new power thus placed in their hands in reference to cases which had become almost an opprobrium to their profession.

Its Discoverer may rightly, and with due self-respect, disdain to notice the irresponsible and mendacious utterances such as that 'results observed in animals are no guide to what may happen in man or woman;' that his methods of gaining the requisite guidance in treatment 'were not new' or 'not true;' and that 'ovariotomy' had rather 'shortened than lengthened the life of woman.'¹ But whosoever may have been trained and had practice in judging of human testimony may be referred to that which has been deliberately put in evidence by the ablest of home and continental operators—evidence sifted and

¹ *Fortnightly Review*, February 1, 1882, p. 229.

discussed in their presence, and subsequently recorded in the 'Transactions of the International Medical Congress,' held in London, in August, 1881.¹ Moreover, Spencer Wells, after being rewarded by due success in the application of what he had learnt by the death of a few narcotised animals, submitted his discovery, the steps in making it, the material evidence thereof, and the happy results in practice, to the Royal College of Surgeons of London, in the Hunterian Lectures at that Institution.

The conditions of the physiological problem being thus fulfilled; the discovery with its legitimate applications being recognised, the deterrent influence of the peritoneal danger was dissipated, and a great and rapid advance was made in what is now termed 'abdominal surgery.'

Incredible as it might well seem, the Lord Chief Justice Coleridge writes:—'I have heard so much of Mr. Spencer Wells's rabbits, that I will own a suspicion that if the baked dogs, and mutilated cats, and gouged frogs,

¹ Vol. ii. pp. 225-292.

and nail-larded pigs, and brain-extracted monkeys, had resulted in anything worth hearing of, I should have heard of that too.'¹

The following—and more to my present purpose might be adduced—is respectfully submitted to competent and equal judges of testimony, in relation to the results of a physiological fact experimentally demonstrated.

In the 'Transactions of the Royal Medical and Chirurgical Society,' for 1880, are recorded the details of the first successful operation of what is now termed, as a new surgical power, 'cholecystomy,' that is, the opening of the cavity of the abdomen, and then that of the gall-bladder, in order to remove morbid growths, or a large impacted gallstone, conditions of the fatal termination of prolonged human suffering.

This success induced Mr. Tait (of Birmingham) to repeat the operation 'in five cases of hydatids of the liver, and in one case of large cystic abscess of the same organ'—both diseases otherwise mortal. 'In six cases of cystic

¹ *Fortnightly Review*, February 1, p. 229.

disease a similar procedure of opening the abdominal cavity on the "Spencer Wells System" was adopted. Every one of these patients made a rapid recovery, and their health is now everything that could be desired.'¹

These releases from long-suffering and death are a sample only of those that should be weighed against the twelve beasts killed under narcotics. Such vindication of the necessity—such testimonies to the blessings, of vivisection—will be followed by others to the end of time with, doubtless, further advances, through physiological experiment in simplifying operations and insuring successful results. Such results, indeed, are already recorded in cases of 'Fallopian pregnancies,' treated on the same vivisectionally discovered 'system.' Of these Mr. Tait has described six cases 'with only one death, though even in that case the child was saved, and is still alive.'²

'Since 1877—that is,' writes Mr. Tait, 'since the new departure made by "Abdominal Surgery"—I

¹ *Trans. Internat. Med. Congress*, vol. ii. p. 229.

² *Ib.* p. 230.

have operated in twelve cases of collection of fluid in the Fallopian tubes, causing intolerable pain. In all of them I opened the abdomen ; the tubes were removed in eleven cases, and I had recourse to "drainage" in one of them. The success of these operations was most satisfactory, for in everyone of them recovery was complete.'¹

The experience in the practice of one individual, in operations which would have been regarded, five years ago, not only as most serious, but almost wholly indefensible and impracticable,² and amounting, in that practice, to sixty-six serious operations, was attended 'with three deaths, or about 4·5 per cent. mortality.'³

The narratives of these cases are followed by those of 'excision of the pylorus,' which had occurred in the practice of Professor Czerny, of Heidelberg ; they were submitted to the 'Medical Congress' as yielding 'another proof of the teaching of Spencer Wells.'⁴ And, in regard to the vivisectional discoveries of our countryman, and those of Péan and Billroth, Professor Czerny con-

¹ *Trans. Internat. Med. Congress*, vol. ii. p. 231.

² *Ib. ib.*

³ *Ib. ib.*

⁴ *Ib.* p. 233.

cludes : ' I have reason to be content with the results, as out of my first fifty completed ovariectomies I only lost five.'¹

Successful cases are then recorded by other eminent surgeons, of splenotomy, salpingotomy, 'nieren extirpation,' or removal of diseased portions or the whole of a kidney, or of a huge calculus from that organ (nephrectomy).²

The inexpressible blessings to suffering humanity, the abolition of direst tortures, the restoration of loved and valued lives to anxious relatives and friends, have not only spread from Britain to the Continent, but like testimonies thereto reach us from America.

Dr. I. Marion Sims, of New York, contributes the happy results of his practice, and generously acknowledges the guiding conditions of such success. He attributes it to 'Mr. Spencer Wells's admirable discovery,' and expresses—

'His surprise that anyone, in this enlightened day, should call in question the need of the vivisectional

¹ *Trans. Internat. Med. Congress*, vol. ii. p. 233.

² *Ib. ib.*

grounds, or the fact of their results. We have the best of reasons why we should so unite the severed edges of the peritoneum. For clinical experience, independently of Mr. Wells's well-directed philosophical experiments on the lower animals, demonstrates most conclusively the importance of this procedure.¹

This distinguished physician of the United States limits the expression of his surprise to the ignorant and irresponsible utterances of some bestiarists, who, exaggerating the consequences of cuts in a dozen narcotised beasts, pose them as outweighing the tortures which cannot be exaggerated of the hundreds of men and women now blessing the new powers given to their healers, and who represent the thousands of similarly afflicted ones, who, in coming generations after generations, will continue to be so blessed by operations guided by the humanitarian results of vivisection. Such considerations should be calmly weighed by those, however well intentioned, who would obstruct our powers of diminishing human sufferings by prohibition of experiments on beasts, few or narcotised.

¹ *Trans.Internat. Méd. Congress*, vol. ii. p. 237.

Dr. Sims and his professional countrymen have the satisfaction and encouragement of their Legislature, which has refused to cast a slur upon their humane and beneficent science and the inductive method of its advancement.

The gifted natures accorded to the human race for the relief of the sufferings of fellow creatures are placed by our British Government on a grade below the butcher, the knacker, the gelder. These vivisectionists may be trusted to do their work without interference or hindrance. The physiologist, who discerns a way to solve a problem, promising by its solution a new power in appliances to remedy the ills to which mankind are liable, must condescend to accept the degrading position assigned to him by the Legislature, and, by such acceptance, tacitly to admit the libellous imputations cast upon him by irresponsible ignorance. And, should he so sacrifice self-respect to gain a power of doing good, fearing to bury his talent, or hide his light, and condescend to humbly petition a State-minister to grant him

absolution for making the needed experiment, he may then be met with the contingency that its effectual performance is incompatible with the restrictions imposed upon the experimenter by the 'Act of Parliament.'

Fortunately for humanity, this 'Act' had not passed when those vivisections were made which have given the results above briefly defined.

I would ask the, if possible, unbiassed attention of agitators for 'total prohibition' to another and larger class of human sufferings which their aim would perpetuate.

7. *Antiseptic treatment.*—The sum of inductively and experimentally acquired physiological knowledge applied in behoof of his profession by Surgeon John Hunter, through his work 'On the Blood and Inflammation' (1794), led to the adoption by his contemporaries and successors of methods of treatment after surgical incisions and accidental wounds best adapted to effect 'union by first intention,' and to obviate in some measure the suppurative and other lethal disturbance of the healing process.

The degree of success so attained earned confidence in Hunter's expositions of the specific characters of the 'adhesive' and other forms of 'inflammation.' Nevertheless, the percentage of failures by degeneration of the adhesive into the suppurative stage, with consequent gangrene and fatal constitutional disturbance, was serious, more especially in cases of hospital practice. But both the science and practice of surgery were irresponsible for such results in Hunter's time and for nearly a century after.

The established medical practitioners in Harvey's days were incredulous as to any gain of power or insight in the treatment or nature of diseases through his experimental physiology. Pott and Bromley maintained the same attitude in relation to the guiding light of the cervine experiment. But Hunter's pupils—Cline, Abernethy, Astley Cooper—lost no time in cavil or doubt, but speedily based brilliant successes on their master's teachings, through light gained by more varied vivisections than Harvey's.

Surgical science and skill seemed to have attained its height. Through a corresponding

rise in public estimation, the 'City company,' with its 'Master, Wardens, and Court of Assistants,' was left to the old associated barbers; and the surgeons were incorporated by the Legislature, on the acquisition by the nation of Hunter's Museum, as a 'Royal College, with its President, Vice-presidents, and Council:' they took rank in social estimate and position with the Fellows of the Royal College of Physicians.

This legislative step and wise appreciation of the scientific conditions of augmented power in relief of human sufferings contrasts with the subsequent 'Enactment,' obstructive or preventive of the methods of gaining such power.

About a century after the dates of Hunter's vivisections others were discerned to be requisite, and were made in elucidation of methods of prevention of the lethal contingencies which occasionally, and under certain circumstances frequently, blighted the improved surgical treatment based upon the principles set forth in Hunter's work.¹

¹ *On the Blood, Inflammation, and Gunshot Wounds*, 2 vols., 1794.

All sciences—all the courses in which the divine gifts of patient and accurate observation are exercised, with experimental application of suggested tests for clearing doubts and gaining proofs—throw unexpected light on one another.

Hunter, like Harvey, availed himself of such magnifying powers as the opticians of their day could supply. Subsequent steps in perfection of microscopes have been many, and such as almost to excuse the belief that the perfection of the instrument has been attained. The main step thereto was made in 1830, by Mr. Joseph Jackson Lister, F.R.S.¹

To the son of my old and esteemed friend is due the greatest gain to surgical power which that healing science applies in its beneficent aims since the time of Hunter.

By the microscope the anatomist has learnt, one thinks, whatever is possible to be seen of the intimate constitution of the solids and fluids of organised bodies ; also of the

¹ 'On some Properties in Achromatic Object-glasses, applicable to the Improvement of the Microscope.'—*Philos. Trans.*, 1830, p. 187.

processes by which they severally acquire their mature characters. By the microscope the naturalist has discovered the existence, characters, and properties of myriads of otherwise invisible germs and monads. By the microscope the chemist has been aided and guided in the experimental methods revealing to him the nature, causes, and conditions of fermentation.

Happily for surgery, Joseph Lister adopted it as his profession, and brought to its service inherited skill as a microscopist, with equal accomplishments in all the other knowledges required for perfection in practice.

The result has been the discovery of the causes of failure of 'union by first intention,' and of the conditions by which operations can be safely performed in cases which the best Hunterian surgeons deemed hopeless, or to be met—as in Pott's treatment of aneurism—by amputation of limb, with the then too frequent fatal result.

Amongst the various lesions and maladies to relieve and cure which the surgeon is 'called in,' those involving exposure of the

cavities of joints, whether by accident, or as a consequence of a healer's final endeavour to abate torture and save life, were the cases on which the most experienced and skilful practitioners looked with doubt and dread, before the nature and causes of suppuration and of gangrene were made known, and prior to the discovery of that which surgeons of all Europe concur in designating the 'Listerian or Antiseptic Treatment.' To the vivisectional experiments essential to the discovery I shall refer after citing some of their results.

Professor R. Volkmann of Halle, communicated to the 'Medical Congress' in London the successes of himself 'in common, I believe, with all those German surgeons who have fully accepted the antiseptic principle.' 'We know,' he writes, 'of no suppuration which does not depend on the influence of organic ferments, and we recognise no other cause of suppuration.—In the worst constitutions, and with the most disordered state of health, no suppuration takes place if "septic infection" is prevented.'¹

¹ *Trans. Internat. Med. Congress*, vol. ii. p. 362.

The power of prevention followed the knowledge of the nature of the causes of the previous baneful results.

Professor Volkmann's reputation rests in a high degree on the removal—'resection' as it is termed—of diseased joints. By the Listerian prevention of Hunterian consequences, Volkmann secured 'union by first intention in nearly 200 resections of the hip-joint,'¹ and he testifies: 'My results have been better year by year, because I have been more and more careful to remove all diseased material,'² and all that would have produced such material prior to the preventive practice invented and introduced by Professor Lister.

Professor Verneuil, of Paris, eloquently discoursed on the ill-results of exclusive faith in the usually adopted treatment of surgical and other wounds by the *prima intentio*. 'L'influence délétère des milieux contaminés sur l'adhésion primitive n'est point douteuse.' He specifies—'Les mauvaises conditions locales de la plaie: l'infection du milieu

¹ *Trans. Internat. Med. Congress*, vol. ii. p. 363.

² *Ib. ib.* p. 362.

ambiant par les endémies chirurgicales vulgaires—érysipèle, pourriture d'hôpital, pyohémie, &c.'¹

By the microscope the 'bacterian' and other 'micro-organisms' were discovered to be the cause of those deadly conditions; by vivisectional tests the prevention and destruction of those causes were learnt.

The experienced hospital surgeon, Mr. F. J. Gant, testifies, after narration of cases cured, which, in Hunter's time, were deemed beyond the power of surgery, as follows:—'These surgical procedures were taken under Listerian antiseptic precautions, with after-dressings accordingly, my house-surgeon having been especially trained by Mr. Lister.' 'If surgeons be compelled to perform operations in a foul hospital there can be no doubt whatever that there the high ritual of Listerian antisepticism has yielded splendid results.'²

The accomplished surgeon of Birmingham, Mr. Samuel Gamgee, in his communication

¹ *Trans. Internat. Med. Congress*, vol. ii. p. 354.

² *Ib. ib.* pp. 366-68.

tempt, to bring home to them the effects of the total abolition and suppression, etc., of such means, not upon themselves only, but upon the public which they address.

It is well and widely known how much distress and pain are apt to follow the dentist's successful stopping of a decayed tooth. This pain is due to the vitality of the residuary nervous and vascular pulp. It has consequently been the aim of the best practitioners in dentistry to discover a substance or means that will destroy the vitality and consequent sensibility of a remnant of the organ which has fulfilled its formative office, without injury to the patient or to the surrounding dentinal tissue.

Such happy discovery was communicated to the 'International Medical Congress' in London, by the eminent dentist and scientific practitioner, Dr. Joseph Arkövey, of Buda-Pesth, in a memoir entitled 'Experiments on the action of some agents used for devitalisation of the tooth-pulp.'¹

Suffice it to say that the 'stopping' of a

¹ *Trans. Internat. Med. Congress*, vol. iii. p. 488.

ings have been terminated and their lives saved.

One of the striking results of the 'Listerian treatment' has been the wide extension of the field for surgical relief which it opened out to view—removal of tumours and of morbid internal organs ; excision of joints, or joint ends, and of shafts of diseased bones : what, also, may sound almost hyperbolic, the making of a new bone in place of one for the excision of which there was a vital necessity. I am tempted to cite the main points of one of those cases recorded by an experienced surgeon of the Westminster Hospital.

A disease of the leg-bone (*tibia*) afflicting the sufferer with unintermitting pains, and threatening dissolution as the sole relief, led to the operation of removal of the bone, with the safe healing which the Listerian method insures. The patient so relieved, limped on her crutches as requested from time to time to the hospital.

' After six months, no vestiges of osseous tissues having appeared in the patient's leg to replace that which I had taken away, and as the limb was

perfectly useless, I determined to endeavour to form a new tibia. I therefore took perfectly fresh very small pieces of bone and periosteum from the foot of a patient's limb I had amputated, and I placed these pieces of bone and periosteum in a groove made in this little girl's leg in the situation of her tibia. The proceeding was conducted on Listerian principles, and no suppuration occurred. From these little bits of bone and periosteum new osseous tissue has formed. A narrow ridge of bone can be felt along the course of the osseous tissues which I planted in her leg. The wound has entirely healed, and, where no bone whatever existed six weeks ago, now a narrow band of osseous tissue has been produced, which we must expect will take some months to grow to any considerable size.'¹

The confidence engendered by the power of preventing the dreaded suppurative stage encourages ideas of novel procedures akin to those recorded by Mr. Macnamara ; they may multiply in unexpected directions and degrees the ways of application of surgical ingenuity and skill, such as would never have suggested themselves or been entertained at a pre-Listerian period.

¹ *Trans. Internat. Med. Congress*, vol. ii. p. 344.

Of the extent to which Professor Lister has availed himself of his curative and preventive methods his contemporary practitioners throughout the civilised world are well aware. To the 'Society for the Protection of Animals from Vivisection' they are unknown ; it is charitable, at least, to presume so. I will restrict myself to obtruding on their notice one other case exemplifying the benefits of 'protection from the "inhumanity" of that society.'

The conditions of the disease in question sound simple, but to the individual so afflicted the frequently recurring shoots of agony and the associated paralysis through unwilling exercise of the limb—certain to excite such agony—render the malady by no means a trifling one. Before the 'Listerian method,' the attempt at cure could not be made save at great hazard to life or limb.

'If' (writes Mr. Lister) 'we suffer ourselves to be drawn aside from the strict antiseptic principle, we shall not only subject our patients to the risk of the old disasters, but we shall be compelled to withhold from them the benefit of valuable procedures which strict antiseptic managements alone can warrant. Take, as a single example,

the case of a loose cartilage in the knee-joint. To remove it by free incision is the most simple and satisfactory treatment, except for the attendant danger which was formerly so great as to be prohibitory, but of which our present means of carrying out the antiseptic principle have entirely disarmed it. If such a procedure was ever ventured on without antiseptic means, the only chance of success lay in accurate closure of the wound with a view to primary union. On the other hand, under antiseptic management, I systematically abstain from closing the wound completely, leaving a part unstitched for the introduction of a drainage-tube, so as to guard against the inflammatory disturbance which might otherwise result from accumulation of fluid in the articular cavity. In other words, I abstain from the only means which would have afforded hope of success without antiseptic treatment, and I adopt means which, without antiseptic treatment must infallibly lead to disaster through septic suppuration of the joint. Here, then, I conceive we have a true touchstone of the truth of the antiseptic principle. The loose cartilage which I hold in my hand was removed from the knee of a gentleman a fortnight ago. It lay imprisoned between the anterior parts of the articular surface of the tibia and the femur. I extracted it by free incision: and as the situation was one which did not admit of convenient insertion of a drainage-tube into the joint, I left the

wound widely gaping throughout. The subsequent process of healing was complete.'

Professor Lister adds :—

'That patient has not since experienced the slightest uneasiness, nor has there been any disturbance, local or constitutional.'¹

When a surgeon proposes an operation which proves fatal, it is likely to affect his practice. Even when his patient, worn out by agony, and learning that otherwise his malady is fatal, prays for the chance of the relief, it becomes a grave test of moral courage when the surgeon consents, does his best, and then hears from some good-natured friend the outside gossip, professional or otherwise, that 'Mr. So-and-So has lost Sir J. E. W., or Mr. R. H., who has died of So-and-So's operation.'

Now, in the time of Hunter and that of his distinguished pupils and successors, the best and accepted practice in a joint-disease, e.g. as above described, would have been to

¹ Lister, Prof. Joseph, *Trans. Internat. Med. Congress*, vol. ii. (1881). 'Proceedings of the Section of Surgery,' p. 380.

tempt, to bring home to them the effects of the total abolition and suppression, etc., of such means, not upon themselves only, but upon the public which they address.

It is well and widely known how much distress and pain are apt to follow the dentist's successful stopping of a decayed tooth. This pain is due to the vitality of the residuary nervous and vascular pulp. It has consequently been the aim of the best practitioners in dentistry to discover a substance or means that will destroy the vitality and consequent sensibility of a remnant of the organ which has fulfilled its formative office, without injury to the patient or to the surrounding dentinal tissue.

Such happy discovery was communicated to the 'International Medical Congress' in London, by the eminent dentist and scientific practitioner, Dr. Joseph Arkövey, of Buda-Pesth, in a memoir entitled 'Experiments on the action of some agents used for devitalisation of the tooth-pulp.'¹

Suffice it to say that the 'stopping' of a

¹ *Trans. Internat. Med. Congress*, vol. iii. p. 488.

prevention, and these could only be had and profitably studied by the way of experiment.

As in Harvey's, as in Hunter's, so in the case of every divinely gifted knower and worker, the purpose in prospect could only be gained, the forward step in science could only be made, by trials.

There were two classes of subjects, as in Spencer Wells's predicament, on which such experiments might be made—the human subject or the beast.

Knowing, microscopically, the cause of the common and torturing fatal results of injuries and operations then deemed desperate, Lister might have made successive trials in combating such cause, guided by his practised skill and accurate watching, on a succession of patients, with concomitant failures, alternating perhaps with gain of some steps, still being short of perfection, and accompanied with fatal results. Whether his life would have been long enough to have been cheered by conditions of success so gained is doubtful ; the requisite number of men and women to be so experimented on is not doubtful.

Being a humanitarian, not a bestiarian, Lister experimentally induced in beasts pathological conditions akin to those in his patients, and by successive and varied treatments and applications succeeded in discovering both the principles and practice, with the requisite appliances in certain conditions and cases; such appliances as his spray-apparatus, etc., whereby he killed or prevented the access of the bacterian enemies—‘our miserable fellow-creatures,’ as Mr. Hutton would call them,¹—and was led to substitute for the Hunterian method those now adopted by the best surgeons of the civilised world—those more especially who grapple with and cure the cases from which an Abernethy and an Astley Cooper would have shrunk.

But with this searcher after truth there was no peace until every residuary doubt or difficulty had been met, every remaining lack of power in his bounden duty to humanity overcome. To this divine end a few other vivisectional experiments were essential.

¹ *Nineteenth Century*, January 1882, p. 32.

At that date the 'Society for the Suppression' of such means of attaining scientific results had gained their impedimentary 'Enactment,' imperatively called for, according to the Lord Justice Coleridge, to stay the procedures of 'a class of vivisectors existing in this country, whose principles and practices alike deserve the strongest reprobation ;' for 'the principles upon which they base themselves are so alarming and (I think) so immoral, that I have become reluctantly convinced it is only by the strongest law, by absolutely forbidding the practice itself, that the grave mischief which follows in holding parley with those claims can be stayed or destroyed.'¹

Joseph Lister could not acknowledge himself to be the perpetrator of 'the inhuman, the immoral, system' which the Nation, through its representatives, and by misrepresentations such as the above, had pronounced 'vivisection' to be ; a calumny which the physiologist may seem virtually to acknowledge, and before which he bows, when sup-

¹ *Fortnightly Review*, Feb. 1, p. 227.

tempt, to bring home to them the effects of the total abolition and suppression, etc., of such means, not upon themselves only, but upon the public which they address.

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¹ *Trans. Internat. Med. Congress*, vol. iii. p. 488.

'The required experiment had reference to the behaviour of a coagulum under circumstances in which it especially interests us as surgeons, viz. within the living body. The experiment was of a character such as it would have been difficult under existing circumstances to perform in London, so I resorted to the "École Vétérinaire" of Toulouse, where everything was most liberally placed at my disposal by my friend Professor Toussaint and others in authority at the Institution.'

¹

Our fellow-creatures will, for all time, reap the benefit of the result.

The healing power so gained by this additional light, added to that previously acquired by humanitarian or vivisectional surgeons, applies to the whole range of their practice, but the cases which their predecessors declined to meddle with are of a severe and, happily, of a rarer nature.

And now, it may be asked, why waste time in giving this condensed statement of what is well known to the qualified practitioner and to every respectable member of the healing profession ?

¹ *Trans. Internat. Med. Congress*, vol. ii. p. 374 (where the needed experiments are described and illustrated).

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¹ *Trans. Internat. Med. Congress*, vol. iii. p. 488.

'Report' (*ante*, p. 6) has been afflicted with any of the maladies discussed in previous pages, or has had personal experience of relatives or friends relieved from the pains of such, and happily cured. But, in the teeming population of Great Britain, there may well be a thousand, annually, so indebted to the conditions described and discussed at the 'International Medical Congress' held in London in August 1881. The experienced practitioners there assembled may, through better experience than mine, regard the estimate of a thousand cases annually, of relief from torture and reprieve from death, as below the mark. But, whatever the number, let it be borne in mind that the power of so dealing with such cases, once got, is never lost; and, that the physiological experiments by which such power is acquired, cease, like Harvey's, with the acquisition.

8. *Toothache*.—There are, however, minor maladies and pains, of which denunciators, male and female, of the means of relief, may have had experience. It seems, therefore, a duty, despite the hopelessness of the at-

tempt, to bring home to them the effects of the total abolition and suppression, etc., of such means, not upon themselves only, but upon the public which they address.

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Suffice it to say that the 'stopping' of a

¹ *Trans. Internat. Med. Congress*, vol. iii. p. 488.

decayed tooth can now be, and for all time will be, effected without the consequent gnawing, depressing pains. I will not use the bestiarian's exaggerations of 'torments,' 'tortures,' 'agonies,' etc., which he or she applies, in profusion, to shorter and minor sufferings of beasts, but simply beg a calm and equal consideration of the question—at what cost to caninity this discovery, so blessed to humanity, has been made?

The following is the reply of the discoverer :—

'The experiments have been executed in the Pharmaceutical Institution of the University of Buda-Pesth on three dogs.'

I believe I shall not be suspected of, though I may be charged with, exaggeration in stating that out of the present population of Great Britain, not to mention that of the Continental, American, Colonial, and other civilised communities blessed by competent dentists, as many millions of human beings have been and will be, in the present generation, relieved through Dr. Arkövy's vivisections from sufferings equal to, perhaps

greater and much more prolonged, than were endured in the behoof of those millions, 'by three dogs.'

Add to these millions the generations of the so-relieved in time to come.

9. *Fevers*.—Of more complex maladies a medical treatment, wholly and always successful, cannot, at present, be predicated ; but a gain of power has been acquired, and that through experimental physiology. It has been gratefully witnessed in cases of so-called 'fever,' as e.g. in the practice of Sir William Gull, Bart., M.D., F.R.S. Fever is an old and vague term, the sign of groups of symptoms, but significant of the fatal one. Relief or cure depends most closely on a knowledge of the bodily state causing or conditioning those symptoms, of which the lethal one is a rise in the temperature of the blood. Such increase of heat affecting the nerves and parts supplied by them is innocuous ; a higher temperature than that of the bird may be enjoyed when merely felt, or limited to the sensational sphere ; but, if the mass of the circulating fluid of a man or mammal becomes

as hot as that of a fowl, it is a deadly condition. The experimental chamber, in determining this guiding fact, required not to be heated above that which is normal in the body of the feathered class, and might be below that of the Turkish bath ; but when so applied as to raise the blood of a dog to that degree, it becomes as fatal as is to man the fever-heat of the blood.

The most experienced of our physicians testify their obligations to Claude Bernard for the intelligent and exact experiments by which he revealed the working of the organic mechanism whereby a 'hæmatothermal' animal maintains in health a constant temperature, and, at the same time, indicates the conditions under which the maintaining thermal power becomes fatally deranged in febrile disease.

Such knowledge lies at the root of successful treatment of fevers, of one or other kind of which thousands annually perish, with, however, annual augmentations of cases of cure. The only honest, moral ground of denunciation of the ways of acquiring the

rational methods of treatment is, plainly, a study of the experimental results teaching such methods. In relation to those, the benefit of which to humanity Claude Bernard, with the modesty of a true philosopher and Christian gentleman, alludes as a small 'instalment of the reward of his labours,' the responsible physician gratefully avails himself of every ray of light and guidance they impart. The healthy non-medical world, after its anti-vivisectional fervours have been heated by declamations against 'mutilated cats, and gouged frogs, and nail-larded pigs,' is appealed to, in relation to Bernard's labours, as follows : 'If the "baked" dogs had resulted in anything worth hearing of, I should have heard of that too.'¹ In the popular illustration of this stupid and ignorant insult to a gifted Experimenter, the blazing billets beneath the red-hot oven and the expiring howls of the 'baked dog' were coarsely and gaudily rendered. Lord Coleridge had a fitting coadjutor in the placarding caricaturist. The two bestiarrians worked harmoniously by pen

¹ *Fortnightly Review*, February 1, 1882, p. 229.

and pencil in exciting the wrath of their respective strata of society.¹

As Sir William Gull truly writes, the result being experimentally shown, of the effects of a rise of temperature in the blood of a mammal to that degree beyond the normal one which is fatal to dog and man, both may be said, in the bestiarian terms, 'to be baked alive.'² The chief cause of febrile mortality is the high temperature of the blood ; it is the veritable danger. 'No wonder, therefore, that physiologists and physicians have anxiously and laboriously occupied themselves in investigating that mechanism of the living body which in health maintains so constant a temperature under varying circumstances, both internal and external, and which becomes so easily and fatally deranged in disease.'³ Sir William's success in the treatment of fever is fully appreciated by the

¹ 'Chronology of the Anti-vivisection Movement, February 7, 1877,' in the *Annual Report of the Victoria Street Society for the Protection of Animals from Vivisection*, issued January 1882, p. 21.

² *The Nineteenth Century*, March 1882, pp. 459, 460.

³ *Ib. ib.* p. 460.

Profession ; it is well known, and was gratefully recognised by the Nation in one important case. And these are the terms in which he speaks of the experimenter who has thrown most light on the lethal conditions and causes of the febrile body :—

‘Thanks to the very intelligent and exact experiments of Bernard, part of this complicated machinery has been traced out ; but the whole matter is so beset with difficulties that the wonder is, not that physiologists have done no more, but that they have explained so much. . . . The complexity of one of the most wonderful of the many wonders of our bodily frame is not to be fully unravelled in twenty years. The subtlety of nature in a living organism demands the labours of many and various intellects before we can hope to obtain even a small instalment of the reward of their labours.’¹

And such labours of gifted and humane pioneers it is the pleasure of bestiarrians to vilify, and the aim of their ‘Society’ to prohibit by an ‘Act of the Legislature’!

10. *The Pulse*.—Evidence has been submitted of the indispensability of vivisectional experiments in giving to the healer a

¹ *The Nineteenth Century*, March 1882, p. 460.

knowledge of the nature of maladies essential to their successful treatment. Such knowledge commonly begins by ascertaining conditions of the vascular system through indications of the pulse. And we may indulge the hope that every member of and subscriber to a society for the abolition of such experiments—when, on the bed of sickness, he or she feels the gentle finger of the physician upon the wrist—may then have some grateful sense of indebtedness to the ‘great vivisector,’ and may be moved to penitent shame for any stain cast upon the memory of William Harvey, or any falsehood detracting from his immortal fame.

I have touched upon the relations of vivisection to the abolition of the actual cautery in arresting hæmorrhage, and to properties of the vascular system guiding to successful treatment of aneurisms. Testimonies submitted to and accepted by the representatives of medicine and surgery in congress assembled, in relation to curative powers gained through vivisections in surgical cases, since the appearance of the work ‘On the

Blood and Inflammation,' have also been briefly stated. I now propose to advert to like relations of this experimental method in guidance of treatment in maladies of the nervous system.

11. *Nervous Diseases*.—A witness (*ante*, p. 5) signatory to the denunciations of such experiments cited above, and whose averments and possible beliefs may be taken to be those of the 'Society,' asserts, behind the mask of an anonymous correspondent :—'We are told that the functions of the posterior roots of the spinal nerves were discovered by vivisection; but disease has made far more accurate experiments.'¹

I am one of the fortunate possessors of the privately printed but unpublished work, —the first announcement of his vivisections—entitled: 'Idea of a New Anatomy of the Brain, submitted for the Observations of his Friends,' by Charles Bell, F.R.S.E. 12mo. Printed by Strahan & Preston, Printers Street, London. (No date, but issued in 1811.) In this opuscle Mr. Bell writes :—

¹ Frances P. Cobbe, *The Fortnightly Review*, January 1, 1882, p. 99.

‘The *medulla spinalis* has a central division, and also a distinction into anterior and posterior fasciculi corresponding with the anterior and posterior portions of the brain. Further, we can trace down the crura of the *cerebrum* into the anterior fasciculus of the spinal marrow, and the crura of the *cerebellum* into the posterior fasciculus. I thought that here I might have the opportunity of touching the *cerebellum*, as it were, through the posterior portion of the spinal marrow, and the *cerebrum* by the anterior portion. To this end I made experiments which, though they were not conclusive, encouraged me in the view I had taken.

‘I found that injury done to the anterior portion of the spinal marrow convulsed the animal more certainly than injury done to the posterior portion; but I found it difficult to make the experiment without injuring both portions.

‘Next, considering that the spinal nerves have a double root, and being of opinion that the properties of the nerves are derived from their connections with parts of the brain, I thought that I had an opportunity of putting my opinion to the test of experiment, and of proving at the same time that nerves of different endowments were in the same cord, and held together by the same sheath.

‘On laying bare the roots of the spinal nerves, I found that I could cut across the posterior fasciculus of nerves, which took its origin from the posterior portion of the spinal marrow, without

convulsing the muscles of the back ; but that on touching the anterior fasciculus with the point of the knife, the muscles of the back were immediately convulsed. Such were my reasons for concluding that the cerebrum and the cerebellum were parts distinct in function, and that every nerve possessing a double function obtained that by having a double root ' (pp. 21-23).

Bell gives no indication here of the species on which he experimented, nor expresses any sense of compunction or dislike to the vivisection. Of any guide to his conclusions as to the motory or sensory nerves from symptoms of disease he is silent. Whatever doubt might have lingered as to the conclusiveness of the phenomena he had caused and contemplated, was dissipated by the more accurate experiments of Professor J. Müller of Berlin and others. But the merit of originality in the great discovery has been gratefully accorded to Charles Bell.

The only reference to pathological phenomena in the 'original Treatise' above cited is the following :—

'I have found at different times all the internal parts of the brain diseased without loss of sense ;

but I have never seen disease general on the surfaces of the hemispheres without derangement or oppression of the mind during the patient's life. If I be correct in this view of the subject, then the experiments which have been made upon the brain tend to confirm the conclusions which I should be inclined to draw from strict anatomy, viz., that the cineritious and superficial parts of the brain are the seat of the intellectual functions. For it is found that the surface of the brain is totally insensible, but that the deep and medullary part being wounded, the animal is convulsed and pained' (ibid. p. 33).

The main result obtained by Bell from his experiments on the brain was the insensibility, so far as any indication of pain was given by his subject, of the superficial or grey portion of the cerebrum. It is confirmed by accidents attended with lesion of that substance.

Milton, referring to the 'common saying' that 'knowledge is no burthen,' feelingly owned that 'what it wanted of being a load to any part of the body it overlaid with a heavy advantage upon the spirit.'¹ The

¹ 'The Reason of Church-Government urg'd against Prelaty.'—The 'Second Book' in 'A Complete Collection of the Works of John Milton,' sm. fol. 1698, vol. i. p. 219.

physiologist knows that the 'part of the body' which is strained and overlaid by such exercise in behalf of mankind, is that most precious and delicate of organs, the brain.

The vivisectional discovery of Charles Bell is a parallel to that of William Harvey. Centuries of progress made, however, the neurologist's discovery a higher, more difficult, more subtle achievement. To have proved experimentally that, of the constituent fibrils of a single and seemingly uniform nerve, one set, like the veins, returned their mode of action—call it 'fluid,' or 'vibrations,' or 'discharges of force'—from the periphery to the centre, whilst another set carried such influence, like the arteries, from their centre to the periphery, was a recognition of a way of work of parts of our frame analogous, in regard to nerve-force, to that relating to the vital fluid. As the veins were shown by Harvey to be exclusively concerned in bringing the blood from all parts of the body to the heart, so the 'nerves,' proved to be 'sensory,' were those which exclusively returned their subtle influence to the

myelencephalon. As the arteries were proved to be the channels which exclusively carried the blood from the heart to the rest of the frame, so the 'nerves,' proved to be 'motory,' as exclusively carried their subtle stimulus from their centre to the muscular system.

Let any intelligent mind try to bring home the tension of thought, the strain of brain-work, in the gifted instruments ordained by Providence to make plain 'created mysteries'! Let the benevolent nature reflect that the instrument is sustained in this concentrated operation of thought by foresight of the benefits which his discovery will enable the healer to render to suffering fellow-creatures: relieving some from a grip of death by partial paralysis; blessing others by alleviation of unintermitting sleep-banishing pains.

When Charles Bell relinquished and ceased to be guided by the experimental method, he went astray, as in the speedily exploded idea of the 'respiratory system of nerves.' Had he continued to test doubts and conceptions by

such experiments as he founded his repute upon, modified and varied as they were in the hands of Prochaska and Marshall Hall, he might have added the 'reflex function' to his title to immortality.

The discoverer of the 'forces which circulate the blood' grounded his claims to the recognition and application of such discovery by contemporary anatomists and physicians upon his vivisectional proofs and demonstrations; and the best friends to the memory of Sir Charles Bell have refrained from flaunting before a non-professional public the evidence of his state of feeling when venial assumptions had been experimentally disproved and unproved hypotheses had been disposed of. Bell's claim to his high position as a physiologist rests, and will always rest, like Harvey's and Hunter's, on the experiments which he devised and practised ('perpetrated,' if bestiarists please) on living and sentient brutes.

Nevertheless, the honest and earnest cultivators of the science felt the necessity of repeating the experiments under conditions which freed them from the sources of doubt

which clung to the mind of the author of the 'Idea, &c.'

Johannes Müller, professor of physiology in the university of Berlin, recognised in the relations of the anterior and posterior roots to the spinal cord in the *Batrachia* a more favourable condition for repetition of the experiment than any mammal could yield. His results made Bell's 'Idea' an established conclusion—a certain gain to physiology—as to one great or main function of the spinal marrow and its nerves. Subsequent experiments on the parts of the brain have raised the knowledge of their uses and relations to a degree beyond, and in rectification of, Charles Bell's 'Idea'; and surpassing, in application to cure of disease, even the great step subsequently made by knowledge of the 'reflex function.'

I cannot but think that some among the titled signers and supporters of 'the Report' (*ante*, p. 5) may reflect upon the anxious, unceasing responsibilities of the Healer entrusted by contemporary fellow-creatures with the care and treatment of their maladies.

Should they spare a thought thereto, let them weigh the following words of such a deservedly trusted, heavily burthened physician: 'Man is liable to convulsions from childhood to old age. Until Dr. Marshall Hall's vivisections at the beginning of this reign, nothing was really known of the convulsive state; but his experiments made it clear that a convulsion is a mechanical nerve process, the beginning of which may be some trifling and removable irritation, which propagates itself along nervous lines to their centres, to issue again in various directions to the muscles and other parts; much after the manner of the electrical force telegraphed to a central office, and thence outward in different lines. And all this may go on in our nerves, without our being in the least conscious of it, until the convulsion begins. Now, prior to Marshall Hall's vivisections, or, to speak more exactly, the vivisections of De Witt, who preceded him, in 1751,¹ it was more or less generally supposed

¹ These, to be so profited by, needed the knowledge, subsequently acquired, of the sensory and motory nerve-tracts.

that convulsions were due to the disturbance of some spiritual force within us.'¹ At a still earlier stage of darkness such 'force' was specified as 'demoniacal,' the convulsionary was 'possessed.'

A larger class of nervous affections, known as 'headaches,' 'giddiness,' 'fits,' a 'seizure' or 'stroke,' 'spasms,' 'epilepsies,' 'palsies general or local,' 'loss of speech,' and 'affections of the special senses,' were but vaguely, if at all known, in the sense in which a practitioner can be said to know a disease, until vivisectional experiments had demonstrated, what Morgagni would have welcomed, their 'seats and causes.'

The power and insight so attained, which guide the practice of Drs. Ferrier, Hughlings Jackson, Franz Müller, H. Weber, Brown-Sequard, Marcovici, Thomas Buzzard, Alex. Robertson, Sir William Gull, and others, are amply and impressively recorded in the 'Transactions of the International Medical Congress.'²

¹ Sir William Gull, in the *Nineteenth Century*, March 1882, p. 465.

² Vol. ii. pp. 6-59.

As in a like concurrent conquest in Natural History a corresponding nomenclature became essential. The terms 'monospasm,' 'monoplegia,' 'hemispasm,' 'hemiplegia,' 'post-epileptiform local paralyses,' 'epileptiform seizures characterised by three phases of onset, and referable to three different parts of the brain's cortex,' 'reflexes of epileptiform seizures,' 'locomotor ataxy,' 'tendon reflexes.' &c., &c., are signs of the physiological discoveries and concomitant power of recognition of affections of the nervous system, acquired to medical science by vivisections other than and added to those of Charles Bell, Marshall Hall and their successors to Professor Ferrier inclusive. And the healer's means of relief have made a corresponding progress.

Without dwelling too much on such powers as are recorded in the volume cited, I may conclude this 'section of evidence to the value and practical indispensability of vivisection,' by alluding to the singular relief of 'nerve-stretching' as, e.g., in cases of locomotor ataxy, and to a previously unsuspected mode of detecting the seat of disease in the

brain, which may be compared to that obtained by percussion in diseases of the chest.

Professor Ferrier, whose vivisections have had for their aim the gain of knowledge where it was most wanted in medical practice, guided by symptoms repeating in his fellow-creatures those which experiment had induced in beasts, discovered that, although a patient so afflicted might not be able to refer to any pain or uneasiness in the part of the brain suspected to be the seat of the disease, yet that tapping over the head, or percussion of the scalp, raised a feeling of pain in the suspected convolution, and nowhere else.¹

This discovery could not but yield a guidance in treatment. Dr. Alexander Robertson, of Glasgow, communicated to the 'Congress' six cases, of which the following is a sample :—

'J. M., aged 13, had been subject to "night-terrors" and fits of somnambulism. Before special treatment was commenced he had two attacks apparently of an epileptic character, being unconscious

¹ 'Pathological Illustrations of Brain-functions,' in *West Riding Asylum Reports*, 1874.

for some minutes, but without distinct convulsive movements. He suffered from giddiness, but said positively he had no headache. However, on tapping the entire head with the finger, distinct pain was elicited in and around the right parietal eminence. A cantharides blister was applied over this part, and he was ordered a mixture containing the bromide and iodide of potassium. A few days afterwards, when the skull was again percussed, he stated that he had now no pain in the part mentioned, nor anywhere else. He continued free from headache, and had no more fits during the two months he remained in the hospital, and left apparently well.'¹

Vivisectional discovery of the relations of local affections of the cerebral surface to certain symptoms of nervous diseases rendered attempts to detect the seat of such cause a natural consequence, and percussion with its results, as indicated by cerebral experiments, was practised by Dr. Robertson in ignorance of the fact that it had been previously tried, and that pain, not previously complained of by the patient, had been elicited at a particular spot by that means in the course of Professor Ferrier's practice. 'The fact,' as

¹ *Trans. Internat. Med. Congress*, 1881, vol. ii. p. 57.

Dr. Robertson remarks, 'that two physicians, quite independently of each other, should have made the same observation adds much to its value.'¹ The recognition by the Legislature of Professor Ferrier's discoveries I shall subsequently, and with pain and shame, advert to ; but, in the present brief record of the relation of vivisection to nervous diseases, I may conclude with the following testimony of the accomplished and justly celebrated Professor of anatomy and physiology in the university of Glasgow : needless, indeed, save to those out of the circle of healers responsible for the treatment of that class of maladies. In his notable lecture, 'On the Relation of Brain to Mind,'² Dr. Cleland, F.R.S., testifies :—

'It appears from the experiments of physiologists, particularly those of Fritsch and Hitzig, and the more extended and altogether invaluable experiments of the much and disgracefully persecuted Dr. Ferrier, that irritation of certain limited portions of the surface of the brain produces movements of different parts of the body, while destruction of them pro-

¹ *Trans. Internat. Med. Congress*, 1881, vol. ii. p. 55.

² 12mo. Glasgow, 1882.

duces corresponding paralysis. Also blindness, deafness, and loss of smell result severally from the destruction of three different portions of the hemispheres. The observations thus made on the lower animals have been followed by much remarkable discovery of partial paralysis in the human subject due to local lesions of the surface of the brain, a discovery most important to the practitioner, but which would have been impossible had not experiments on monkeys been made.¹

Irresponsible ignorance may prate of pathology as a substitute. Post-mortem examinations, inevitably few and far between, might have suggested to a rarely-gifted observer some relation between a diseased portion of brain and more or less of the symptoms of a long-endured malady before aggravating increase and extension of distressing symptoms had caused release by death. But such suggestions or suspicions would weigh little in the balance against convictions produced by symptoms following purposive injury to a given part of the brain in a healthy brute.

Here, as in the relations of vivisection to

¹ *On the Relation of Brain to Mind*, p. 30.

medical and surgical practice previously submitted, the humanitarian will weigh the case of the monkey with the countless miseries to mankind cured or relieved by the precise and positive knowledge acquired by a few vivisections ; such knowledge being applicable to afflicted millions throughout all time.

Contrast the conditions of a practitioner called in to a case before which he stands in conscious ignorance of the nature, of the cause, and of the locality of the lesion to which it is due, with those of the practitioner who, guided by recognition of symptoms repeating those which had resulted from a given experiment, applies his treatment to the so-known cause—the locality of the brain in fault—and is blessed, with his patient, by relief and ultimate cure. Consider, also, that the positive knowledge of the nature and cause of a previously obscure nervous malady, with the successful treatment based on such knowledge, becomes a ‘possession for ever’—a power of good in the hands of not only the present, but of all future generations of healers !

12. *Bestiarian Replies.* The unbiassed, equal-minded humanitarian may now ask, What reply have the bestiarians to make to the facts and conclusions in the 'Folkestone Address' and the foregoing 'Supplementary Instances'?

Their reply, and it is the only one, is—'that of the alleged achievements of vivisection, some are no achievements at all, and others are due, not to experiments on animals, but to microscopic research and clinical observation.'¹

13. *Repudiation of Harvey.* In the first category are placed Harvey's experiments; and the common conviction of physiologists is met by the assertion that 'the circulation of the blood was discovered sixty years before'²—that is, in 1568; the date of the first edition of the '*Exercitatio anatomica de motu cordis et sanguinis, in animalibus: Gulielmi Harveii, Angli,*' &c., printed and published at Frankfurt, being 1628.

But an earlier questioner of Harvey's

¹ F. P. Cobbe, in *Fortnightly Review*, Jan. 1, 1882, p. 103.

² *Ibid.* p. 99.

claims to the discovery goes much further back. In a criticism of Wotton's 'Comparison of Antient and Modern Learning,' Swift writes of Homer :—' We freely acknowledge him to be the inventor of the *Compass*, of *Gunpowder*, and the *Circulation of the Blood*.'¹

I know not whether a glance at the title-page of Harvey's rare booklet above cited, in the reading-room of the British Museum, and seeing it to be an 'Exercitatio anatomica' may have engendered the notion, but Miss Cobbe proceeds: 'The circulation of the blood was discovered sixty years before by the dissection of the dead body, and could have been demonstrated beyond dispute by the simple expedient of injecting the arteries with coloured size.'² Now, this was precisely what Hunter did, as his 'preparations' show, after he had found out that the capillaries enlarged 'under the stimulus of necessity.' As to what way the subsequent injection of coloured size would have dispensed with the previous ligature of the carotid in the living animal,

¹ *A Tale of a Tub*, ed. of Works, 12mo. 1751, p. 314.

² *Fortnightly Review*, Jan. 1, 1882, p. 103.

in Hunter's case, Miss Cobbe is silent. Nor was Harvey cognisant of that simple substitute for his laborious and manifold vivisections. Both physiologists were born too soon.

The pen-woman of the 'Bestiarian Society' modestly fortifies her conviction of the light-giving power of 'size-injections' by the testimony of 'a very eminent surgeon,'¹ known to her to be such, otherwise to us unknown.

I regret that at present I have nothing to offer in return, save to submit to Miss Cobbe some information, the lack of which she, with a rare candour, admits. At the same time this ignorance is not to be ascribed to any incapacity or indisposition to research in the individual, but to a 'decree of fate.' 'By some fatality I have never read of any vivisectional experiments on fishes at all.'²

With due belief in her linguistic accomplishments, I submit the following confession in Harvey's own words: 'Caput Secundum. Ex vivorum dissectione, qualis sit cordis motus.' (Chapter II. Showing from vivisec-

¹ *Fortnightly Review*, Jan. 1, 1882, p. 99.

² *Ib.* p. 94.

tion what is the mode of motion of the heart.) After demonstrations of the heart's motions in warm-blooded animals, the physiologist proceeds: 'Hæc manifestiora in cordibus frigidorum animalium, ut bufone, serpentibus, ranis, cochleis, gammaris, crustatis conchis, squillis, et *pisciculis omnibus*.'¹ (This is more evident in the hearts of colder creatures, as toads, serpents, frogs, snails, shrimps, lobsters, squills, and *all kinds of little fishes*.) I subjoin for less accomplished critics a translation of the passages quoted. Several little fishes contributed to the phenomena at which contemporary physicians gazed during their 'College-lectures.'

Again, with regard to the evidence of colour as affected by the vital fluid admitted and expelled during these movements of the heart: 'Notandum insuper in *piscibus*, et frigidioribus sanguineis animalibus, illo tempore quo movetur, cor albidioris coloris esse; cum quiescit a motu, coloris sanguinei saturum cerni.'² (Moreover, it is to be ob-

¹ Gulielmi Harveii, *Opera Omnia*, 4to. 1766, *Exercitatio Anatomica de Motu Cordis et Sanguinis*, p. 22. ² *Ibid.* p. 23.

served in fishes and the colder animals that have blood—as serpents, frogs, &c.—at that time when the heart moves it becomes whitish, when it rests it assumes a sanguine colour.)

Then follow certain physiological deductions, new to his hearers, and appreciated by the junior ones : ‘ Cor *anguillæ* exemptum et super tabulam aut manum positum, hoc facit manifestum ; æque etiam apparet in corde *pisciculorum*.’¹ (The heart of an eel taken out and laid upon a plate or upon one’s hand doth evidence this, as equally appears in the hearts of fishes.) And here I am moved to remark that when eels, stewed or fried, are enjoyed by a bestiarian, he or she may mentally compare the degree of torture by exposure of the heart in one simple incision with that endured in the skinning of an eel alive. The latter is the constant precursor of the sale to the cook, and it will be so until a truly compassionate ‘Society’ shall agitate for an Act of the Legislature to ‘put it down.’

¹ Gulielmi Harveii, *Opera Omnia*, &c., p. 23.

But leaving comment and resuming instruction, I next quote :—

In 'Caput tertium. Arteriarum motus qualis, ex vivorum dissectione.' 'Similiter etiam in *piscibus* secta fistula, quæ e corde in branchiis ducit, quo tempore cor tendi et contrahi videbis, eo una etiam sanguinem exinde protrudi cum impetu.'¹ (Chapter III. The mode of motion of the arteries, shown by vivisections. So likewise in fishes, cutting the tube or artery that leads from the heart to the gills, you shall see that when the heart is tense and contracts, that the blood is forcibly ejected from such artery.)

So also in 'Caput Quartum. Motus cordis et auricularum qualis, ex vivorum dissectione. In *piscibus*, et ranis, et similibus, quæ unum ventriculum habent cordis, et pro auricula vesicam quamdam in basi cordis positam, refertissimam sanguine; hanc videbis vesicam primo contrahi, et subsequi postea cordis contractionem apertissime.'² (Chapter IV. The modes of motions of the heart and

¹ Gulielmi Harveii, *Opera Omnia*, &c., p. 26.

² *Ibid.*

auricles shown by vivisections. In fishes, frogs, and the like, having but one ventricle to the heart, and, for an auricle, have a small bladder at the heart's base full of blood, you shall most plainly see the auricle first contracted, and next the contraction of the ventricle.)

Will Miss Cobbe kindly allow me to think that, in recalling her hazardous assertions, the cheeks may show transiently something of the tint of her 'coloured size-injections,' and to believe that she may be open to some conception of the state of medical ignorance which needed such pains and endeavours to dissipate, as have earned for the light-bringer—a truly divine gift to us—that veneration which, among other recognitions of his countrymen, the College of Physicians publicly testifies by the 'Annual Oration' devoted to the 'Discoveries of Harvey, and the encouragement of his methods of making them?'

Not to experiments alone, nor to 'anatomy' as then exclusively understood, but to 'comparative anatomy' did the great and original discoverer devote his unwearied

labours. The latter science had hardly advanced a step in Harvey's time beyond the *περὶ τῶν ζῶων* of the Greek philosopher. 'Observavi quoque in omnibus pene animalibus cor vere inesse ; et non solum (ut Aristoteles dicit) in majoribus et sanguineis, sed in minoribus, exsanguibus, crustatis et testaceis quibusdam, ut limacibus, cochleis, conchis, astacis, gammaris, squillis, multisque aliis : imo vespis, et crabronibus et muscis, ope perspicilli ad res minimas discernendas, in summitate illius particulæ quæ cauda dicitur, et vidi pulsans cor, et aliis videndum exhibui.'¹ (I have observed that a heart is present in almost all animals—not only (as Aristotle says) in the larger, blood-possessing kinds, but in the smaller (white-blooded) so-called 'exsanguineous' ; as, for example, in certain 'crustacea' and 'testacea,' such as slugs, snails, oysters, lobsters, crayfish, shrimps, and many others ; even also, in wasps, hornets, and flies.) 'There is but little evidence of the heart,' admits Harvey, 'in the dead creatures ; but, if opened alive, the organ manifests itself

¹ Gulielmi Harveii, *Opera Omnia*, &c., p. 31.

by its pulsations. By an optic glass made for the discerning of minute things, in the upper part of their body, which is called tail, I saw the heart beat, and showed it to others.'

I am glad not to be within hearing of the scream with which some amiable reader may receive this testimony of Harvey's enormities. For are not all these animals, as Mr. Hutton has shown,¹ our 'fellow-creatures'!

When Miss Cobbe contemplates, from a marine retreat, a sunny prospect of sea and shore, she may be disturbed by the entry of an angry wasp or hornet, persistently threatening a fair and sensitive surface, and refusing any milder form of ejection or defence than a crush against the window-pane. To this effectual delivery less humane natures than hers may and do resort; yet Harvey treated them more gently.

An anti-vivisectioniste may enjoy, at such sea-side holiday, shrimps to breakfast, and add lobster-sauce to the luxury of a turbot; but then, for full fruition, she must exclude all memory or recognition of the fact that, to give

¹ *Nineteenth Century*, January, 1882.

such gratification to the palate, both crustaceans have been 'boiled to death.' Harvey could plead higher, less sensual aims when he scrutinised with such magnifiers as were made in his time the actions of the parts which a simple incision had exposed in a few examples of *astaci* and *gammari*. Miss Cobbe should remember that there are more of such 'fellow-creatures' submitted to the torture of being 'boiled to death'¹ in one day, than are the subjects of a year's devotion to the scrutiny of vital actions by all the Continental physiologists at whom she rails.

Again, in a sea-side lodging it may happen that the couch for repose is 'bug-haunted.' *Cimex lectularius* is, nevertheless, as richly

¹ 'Coroner's Inquests': *Daily News*, April 14, 1882. Death from eating Periwinkles.—The vendor's defence is as follows: 'Mr. Wheeler stated that he bought a bushel of winkles on Thursday, boiled half of them, and kept the remainder alive until Saturday. When he bought them they were all alive, and he kept the other half alive by feeding them. On Saturday he boiled the second half, and it was a portion of the second half that he sold to the deceased. They were perfectly fresh when he sold them, and he had had no complaints from any other of his customers. The winkles were boiled in a galvanised iron copper, which was the proper vessel for cooking such fish.'

organised, as well endowed with brain, nerves, heart, and vascular system, as were Straus-Durckheim's cockchafers, the subjects of his noble anatomical Monograph.¹ May we be cheered by supposing that the hemipterous wanderer being caught in the act, fatal to slumber, of endeavouring to extract an atom of superficial subcuticular fluid, with consequent titillation, from a delicate-minded recumbent, is carefully restored to some safe cranny in the bedstead?

The crushing out of life by multiplied fractures of the skeleton, with coarse and manifold lacerations of the most vital and sensitive tissues, must be 'a torture of a creature of God which no real or supposed benefit to be thereby derived can give to man or woman a right to inflict.' 'Nothing can justify—no hoped-for relief—such horrors as these.'²

Consistency with Mr. Hutton's estimate of an invertebrate's claim to fellowship with

¹ *Considérations générales sur l'Anatomie comparée des Animaux articulés*, 4to. 1828.

² *Vivisection* : 'Four Replies,' *loc. cit.* p. 102.

him,¹ and sympathy with Miss Cobbe's logical inference 'that such torture, the most cruel of cruelties, is most demoralising to man,' will guide, let us hope, in the 'advance of civilisation,' to other treatment than the shrimp and lobster receive from the boiler of the fish-wife, and the cockroach on the kitchen-floor from the heel of the cook-maid.

And let it not be supposed that the benevolent and religious nature of Harvey was less open to the claims of the lower animals to every consideration, subordinate to the needs of man, than are the loudest of the declaimers against the derivation therefrom of any physiological fact throwing light upon the nature and treatment of human sufferings on the bed of sickness.

After demonstrating the bearing of that beneficent knowledge of the phenomena he had witnessed, Harvey apostrophises :—' *Ad viliorum animalium inspectionem, cum Heraclito apud Aristotelem, in casam furnariam (sic dicam) introire si vultis, accedite; nam neque hic Dii desunt immortales.* Maxi-

¹ *Nineteenth Century*, January, 1882.

musque omnipotens Pater in minimis, et conspectior vilioribus, quandoque est.’¹ (If you will enter, with Heraclitus, according to Aristotle, into a work-house (for so I will call it) for inspection of viler creatures, come hither: for the immortal gods are here likewise; and the great and Almighty Father is sometimes most conspicuous in the least and most inconsiderable creatures.)

But neither Harvey’s nature nor his aims shielded him from the abuse as gross, as senseless, and as libellous as that which has been heaped by bestiarian individuals and societies upon his successors and disciples. ‘Vituperatores, momos, scriptoresque convitiarum labe sordidos, ut nunquam legendos mecum statui (ut a quibus nihil solidum aut præter maledicta egregium sperandum), ita multo minus responsione dignos judicavi; neque (quod præstantissimum optandum) sapientiam donat Deus Optimus improbis.’² (Detractors, momes, and writers stained with railing, such as I never intended to read any

¹ Gulielmi Harveii, *Opera Omnia*, &c., p. 110.

² *Ibid.* p. 109.

of them (from whom nothing of solidity, nor anything extraordinary is to be hoped for, but bad words), so did I much less think them worthy of an answer. Let them enjoy their own cursed nature ; I believe they will find but few favourable readers ; neither does God give wisdom to the wicked, which is the most excellent gift, and most to be sought for. Let them rail on still, till they be weary, if not ashamed of it.)

Time has but little effect on some natures : Harvey's words are applicable to railers at his practice and philosophy at the present day. True it is, the cause of envy and abuse which our physiologist deprecates was not the facts of his vivisections but the inferences which he drew from them, in dissipation of the ignorance and erroneous notions of contemporary physicians throughout Europe as to the function of the organ which, rightly to be understood, was the most important of all in initiating a true diagnosis of the ailments of their patients. When Harvey's deductions could not longer be rejected and ceased to be assailed, there arose a lower, because more

ignorant race of revilers, on whom he condescended to cast the merited contemptuous notice above cited.

To those revilers, vituperators, and evil speakers the powers that were in Harvey's time gave no countenance, interposed no degrading obstacles in his path to truth.

As Harvey laboured in the cause of humanity, with an increased, improved power of healing ever in view, he showed his methods and expounded their meanings unreservedly to his fellow-physicians. To the best of these in learning and social position he commends his little book of 1628.¹ To Dr. Argent—'Excellentissimo et ornatissimo Viro'—'President of the College of Physicians in London, and the rest of the Doctors and Physicians my most loving Colleagues, I commend this exposition of my anatomical and experimental proofs, confirmed by ocular demonstration for nine years or more in your sight.'

As a rule the first act of the healer when

¹ *Dedicatio Presidi et Collegio Medicorum Londinensi.*
(*Opera Omnia*, 4to. p. 5.)

called in to the sick person is to place his finger on the wrist, and from the motions of the subjacent vessel gain insight into the action of the heart and general state of the blood-carrying system. But before those actions and conditions were known the 'pulse' could give no knowledge, or worse than none. For what were the notions current and accepted in the physiological and medical world when Harvey's flood of light shone forth upon it?

The 'blood' of the human body was held to be exclusively contained in and to be moved to and fro along the vein and vena arteriosa, with the intervening auricle and ventricle. The arteries contained the 'vital spirits'; the name of these vessels indicates the nature of their supposed contents. But there were two kinds of carriers of this subtle vital fluid in animal bodies—the '*arteriæ leves*' and the '*arteriæ asperæ*.' For the 'smooth air-carriers' anatomy retains the old name, but in an arbitrary sense; the 'rough carrier' is the 'trachea' or wind-pipe. By subtle actions of lungs and heart the air, so inspired,

was made 'vital : ' the 'vital' spirits were taken into the heart, as 'primum mobile,' source of life, by its power of dilatation, called 'diastole,' as the air is drawn into a pair of bellows, and the contents of the arterial system moved to and fro, 'like the tides of Euripus,' by actions of the 'arteriæ leves ; ' hence, as was believed, the movement felt in the pulse.

René Des Cartes accepted, in the main, Harvey's discovery, and gave it praiseworthy recognition, but could not assent to that conclusion which Harvey drew from his vivisections as to the movements of the parts of the heart, and their relations to the movements of the blood. He still held to, and argued for, the suction-power of the heart, and to the 'diastole' as the condition of the blood's motion in the arteries. And, in relation to Harvey's 'arterial blood,' Des Cartes could not extricate himself from the prevalent notions. 'The difference,' he writes, 'which is observed in the blood which passes out of the veins and that which flows from the arteries can rise from no other reason than

this, that, passing through the heart, it is rarified and, as it were, distilled ; and so becomes more subtle, lively, and warmer, so soon as it comes out from thence—that is to say, when it is in the arteries than it was before it entered into them, that is, when it was staid in the veins.’ Des Cartes then compares the calorific function, which he ascribes to the heart, to that by which hay is set on fire when it is put in stacks before it be dry : i.e., to a kind of fermentation. And here he calls in question Harvey’s vivisectional explanations of the movements of the several parts of the heart and the relations of the valvular structures thereto, and reverses the functions of the ‘systole’ and ‘diastole.’ Those who ‘read into’ Des Cartes’ musings on physiological matters by the light of Harvey’s and subsequent discoveries, have posed him as a better physiologist than he has claim to. His relations to the science of life are analogous to those he held to physical science prior to the discoveries of Newton.

But to return to the parallel discovery of

Harvey. There be of his countrymen, and, I blush to say, his countrywomen, 'subscribers to the Society' (p. 5) for the total abolition of experimental physiology, who not only, ignorantly and shamelessly, affirm that the discovery was made sixty years before Harvey's time; but also, somewhat inconsequentially, that he might have made it, without any vivisection at all, by simple deduction from the anatomical discovery of his master Fabricius ab Aquapendente.

But neither the Paduan teacher nor his predecessor Sylvius, viewing the little flaccid folds in the dead body, deemed them to fit so closely in the living one as to compel the course of the blood in one and the same direction. They deduced conclusions from what anatomy showed them. With respect to the veins of the limbs, the 'valves,' as we now term them, served to offer a certain obstruction to the downward flow, lest too much weight of blood might settle there. And, when Harvey pointed out that the valves of the jugular veins were so disposed and adjusted as to compel the downward

flow and hinder the upward one, his opponents objected that the valves there only served so far as to check a too great upward current, such as might cause an apoplexy.

And here I may ask the unbiassed attention of a reader to this doubting, denying, condition of the contemporary medical and physiological mind, as one justifying Harvey, who desired to dedicate his immortal 'Exercise' to his Sovereign, in demonstrating by a vivisectional experiment, in the king's presence, the truth of what he had to declare. And, moreover, the 'Court' may have heard that other and older physicians had their doubts about this new-fangled notion of the circulation of blood. Therefore, said Harvey, 'come and see.'

'In the presence of the King, my master, and before many of the nobility, I exposed the internal jugular vein in a living doe, which vein was cut and divided in the middle. From the lower part scarce a few drops did issue, whilst in the mean time the blood with great force, and breaking out in a round stream, ran out most plentifully downwards from the head through the upper orifice of the divided vein. You may observe the same

[continues the great vivisector] daily in phlebotomy, in the flowing out of the blood ; if you hold the vein fast with one finger a little below the orifice, presently the flux is stopped, which, after you let it go, flows abundantly as before.'¹

And why, it may, and probably will, be asked, might not that observation have served to clear up the whole problem of the circulation ?

Phlebotomy had been practised centuries before Harvey, and by thousands of operators, but none of them knew or, perhaps, thought of, the nature of the phenomena under their eyes. They were like the fellow-guests of Columbus, who could not, try it as they might, get their egg to stand on one end, till he showed them how. So it is, and I suppose ever will be. Fools are never wanted who know not their own unwisdom ! Yet they are not called upon to deny the light of day when the sun shines. And the

¹ ' In jugulari venâ internâ denudatâ damæ vivæ (coram multis nobilibus et Rege serenissimo, domino meo, assistentibus) per medium divisa et abrupta,' &c. See *Exercitatio altera ad J. Riolanum, in qua multæ contra circuitum sanguinis objectiones refelluntur*.—Gulielmi Harveii, *Opera Omnia*, 4to., 1766, p. 126.

cuckoo-cry is repeated that Harvey had no call to make his experiments and his so-called 'discovery,' when all the world had known it for sixty years!

In the first English translation (12mo. 1653) of Harvey's 'Exercitatio de Motu Cordis et Sanguinis' (Frankfurt, 1628) Dr. Zacharie Wood describes it, in his preface, as 'setting out a new and unheard-of opinion concerning the motion of the heart and circulation of the blood.'¹

The learned professor of physic in the University of Lovain, Vopiscus F. Plempius, in his work on the Foundations of Physic, candidly admits that this discovery of Harvey's 'did not please me at first, which I did testify both by speech and writing against it; but afterwards, when I did most earnestly endeavour to refute and explode it, I was refuted and exploded myself, so much are his

¹ *The Anatomical Exercises of Dr. William Harvey, Professor of Physic, &c., concerning the motion of the Heart and Blood*, 12mo, London, 1653. If Miss Cobbe reads not latin, she has access to the reading-room, Brit. Mus. As an honest woman she should have read this translation before forming an opinion of Harvey's originality: as a modest one, before expressing her opinion in print.

reasons not only persuading but enforcing : and diligently did I examine it all, and, in some dogs, dissected by me for that end, found it to be very true ; being likewise advised to do so by a most famous man, Walæus, Professor of Leyden.'

The contemporary teacher of anatomy in Paris was not so candid or open to conviction. Harvey, in his 'First Reply' to Professor John Riolan, who knew nothing of Servetus' statement of the course of the blood through the lungs, showed how his experiments demonstrated this course to be a 'second or lesser circulation ;' and remarks that 'the most learned man (Riolan) might have added a "third circulation," which is a very short one ; not of the left ventricle into the right, through the septal porosities ; but drawing also a part of the circulating blood through the coronal arteries and veins, by their branches, which are distributed about the body, walls, and septum of the heart.' 'He that admits of one circulation cannot,' Harvey remarks, 'deny the other, nor can he refuse the third.'

The 'Exercitatio' was first and best received in the Low Countries. The great Professor in the University of Paris, to whom Harvey submits the foregoing observation, had set forth a 'Treatise,' in which, granting that there is blood which circulates, and that the aorta and vena cava may be reckoned 'circulatory vessels,' yet denies that function to their branches—'because the blood running out into all the parts of the second and third regions, stays there for nutrition, nor does it flow back to the greater vessels, but being impelled back by force when the greater vessels are in great want of blood, etc., which I' (Riolan) 'have clearly demonstrated against Harvey and Walæus.'

On which Harvey remarks that Professor Riolan 'would partly acknowledge, partly deny, the "circulation of the blood," and endeavours to build a reeling and tottering opinion of the circulation. Lest, forsooth, he should destroy the ancient physic, and not moved by truth which he could not choose but see; rather fearing to retract that physio-

logy which he had before published in his "Anthropologia." '1

This I quote chiefly to show our Bestiarians, especially the non-anatomical titled and legislative ones, the true position of the discovery in question at the period of the discoverer.

The majority of the subjects of Harvey's vivisections were of the cold-blooded, less sensitive classes; and, when he looked for light into the circulating mechanism of the bird, our Christian Philosopher, with his divine aim in view, striving to get and teach a better comprehension of the maladies of his fellow men and women, recalled the text, 'Ye are of more value than many sparrows.'

A man of another mould, puffed up by delivering his sentences from a fallible judgment-seat, presumes to anticipate those of the Supreme; and, with taste as questionable as reverence, asks, 'What would our Lord have said—what looks would He have bent upon a chamber filled with "the unoffending creatures which He loves," dying under torture deliberately and intentionally

¹ *Opera Omnia*, &c., p. 109.

inflicted, or kept alive to endure further torment, in pursuit of knowledge?'¹

What He may 'pronounce lastly' on such idle and exaggerated scoff and insult cast upon our knowledge-seeking countrymen, the humble, faithful, followers of Him whose works on earth were mainly those of the Healer, I presume not to surmise.

But this we know, that Christ hesitated not to put to a drowning death a 'great herd of swine (they were about two thousand)'² in causative relation to the healing process of a single human lunatic (one possessed).³

True it is, there were then Bestiarians who took part with the swine, and prayed the Healer 'to depart out of their coasts.'⁴

Vivisection, though the chief, was not the sole ground on which the acceptance of his

¹ Lord Coleridge, in the *Fortnightly Review*, February 1, 1882, p. 236.

² 'Καὶ ἐξελθόντα τὰ πνεύματα τὰ ἀκάθαρτα εἰσῆλθον εἰς τοὺς χοίρους· καὶ ὥρμησεν ἡ ἀγέλη κατὰ τοῦ κρημνοῦ εἰς τὴν θάλασσαν· ἦσαν δὲ ὡς δισχιλίοι· καὶ ἐπνίγοντο ἐν τῇ θαλάσῃ' (Mark v. 13).

³ 'ἄνθρωπος ἐν πνεύματι ἀκαθάρτῳ' (*Ib.* 2).

⁴ 'Καὶ ἤρξαντο παρακαλεῖν αὐτὸν ἀπελθεῖν ἀπὸ τῶν ὁρίων αὐτῶν' (*Ib.* 17). The translation is the same in both 'Old' and 'New' Versions.

discovery by the medical profession was commended and ultimately achieved.

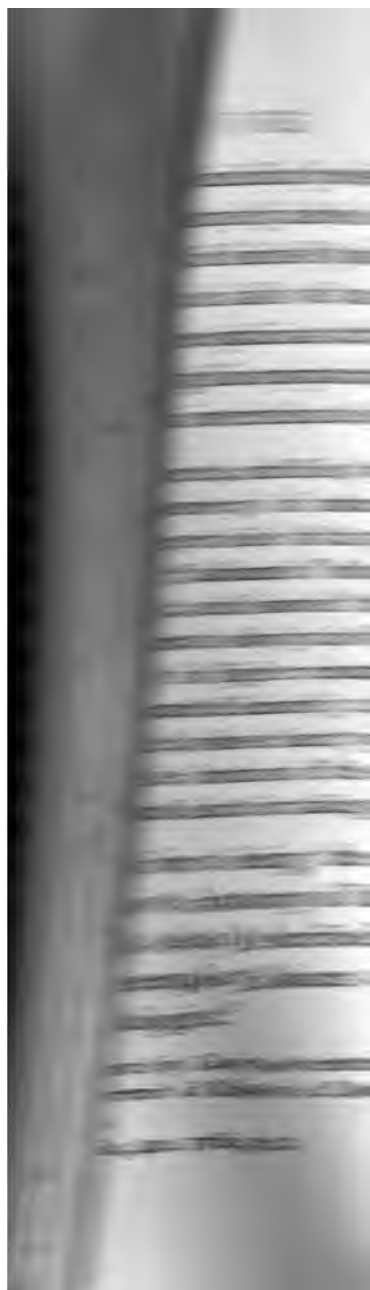
Harvey availed himself (not of 'size-injections' but) of the aids of such magnifying instruments as the opticians at that date could supply; extending his comparative anatomical researches to the invertebrate classes.

'In wasps, hornets, and flies, by an optic glass made for the discovery of minute things, and applied to the upper side of that part which is called their "tail" ("abdomen" of entomologists), I saw the heart beat, and showed it to others. In them the heart beats slowly and with deliberate strokes, as it does in higher creatures which are dying, and is contracted leisurely; as, in a snail, is easy to be discerned, whose heart you will find in the right side at the bottom of the orifice, which it seems to open and shut for taking of air.'¹

This is far from being the only fact in the 'Comparative Anatomy of Invertebrates' which was first clearly described in the extensive and exemplary labours of the great English physiologist.²

¹ As was shown by Cuvier, two centuries later, in his *Mémoires pour servir à l'Histoire et l'Anatomie des Mollusques*, 7to. 1816.

² *Opera Omnia*, 4to. 1766, p. 22.



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Nor did he exempt himself from the trouble and pains of investigating the phenomena of development in the higher animals. Noting the continuance of the muscular movements in parts of the heart long after they contained blood, or had blood to expel, Harvey proceeds :—

‘A thing of the like nature in the first generation of a living creature most evidently appears in a hen’s egg, within the seven days after her sitting. First of all, there is in it a drop of blood, which moves, as Aristotle likewise observed ; this, receiving increase as the chick is formed in part, the auricles of the heart are fashioned, which beating, there is always life ; then in a few days the body begins to receive its lineaments, and then is the body of the heart framed.’

So that one cannot say (Harvey proceeds) ‘that the heart is the first thing that lives and last that dies ;’ but rather the auricle that ‘lives before the heart and dies after it.’ Here ‘heart’ is synonymous with ‘ventricle.’¹

Harvey farther illustrated by pathological observations his conclusions as to the seat and kind of force by which the contents of

¹ *Opera Omnia*, p. 40.

the left ventricle were propelled along the arterial system. In, and prior to, Harvey's time, the 'beat' of the heart, as I have before stated, was held to be due to its dilatations, that of 'pulse' to contractile actions of the coats of the artery.

'But I have [he writes] a small piece of the descending aorta, together with its two crural branches (iliac arteries) about the length of a span, taken out of the body of a very worthy gentleman, which had turned into a bone, like a pipe, through which, whilst he was alive, the blood was driven in its descent to the feet, in which it did agitate the arteries by its impulsion ; but this action could not take place in the ossified part of the arterial tract, but through the impulse which the blood had received from the contraction of the left ventricle, by which force it was continued along the unossified vessels.'

Thus he met the received notion of the pulsatile, contractile property of the arteries :—

'I knew, also [he proceeds], in another worthy and gallant gentleman, the aorta, and the descending part of it near the heart, was turned into an arched tube of bone ; yet so that the heart's "pulsific faculty" was not intercepted, nor could the

rest of the arteries depend for their beat solely upon the contraction of their proper tunics.'

He next records a case of aneurism :—

'A certain person had a great swelling which did beat on the right side of his throat, near to the descent of the subclavian artery into the armpits, begotten by the corrosion of the artery itself, which grew bigger and bigger every day, being filled with the immission of blood from the heart at every pulsation. This state of the parts was found upon cutting up the body after he was dead. In this "patient" the pulse of his arm upon that side was very weak, by reason that the greater portion and influx of blood was turned into the tumour and so diverted.'¹

The light obtained from pathology taught nothing of that which was due to vivisection : the morbid phenomena were observed in corroboration of deductions from experiment and explained thereby for the first time : prior to Harvey they drew no attention from the physician or surgeon, had no significance to them of the relation of the sanguiferous system to the course of the blood.

¹ *Loc. cit.* p. 27.

To a 'legislator' the case might be put as follows : Suppose the number of animals experimented on by Harvey to have been one hundred, or, say, two hundred ; and, accepting the conclusion of many contemporary and all subsequent physiologists that thereby, and only so, could the motions of the heart and the course of the blood have been found out, such evidence being accepted and the demonstration acknowledged ; also, admitting that neither knowledge of small flabby membranes in dead veins, nor size-injection thrown into the vessels of a dead human subject, could have enriched physiology with Harvey's discovery,—there next has to be considered its influence on practice.

Confident in that discovery, the practitioner deduced from the beating of an artery the state of the vascular system, with the kind and degree of its disturbance in the patient to whose care and for whose relief he had been called in.

It should be obvious to every intelligent non-medical mind that a Healer with that

knowledge had more power to cure than one without it.

Now, Harvey lived long enough to know that the whole medical profession availed themselves of his discovery by intelligently 'feeling the pulse.'

How many patients *per diem* might each practitioner visit in his rounds or receive into his consulting-room? Even in Harvey's day they must have exceeded in number, by many times, the animals, from the dog downwards to the hornet and shrimp, sacrificed to discover and demonstrate the 'circulation of the blood.'

There is no evidence that these vivisections were ever repeated, at least in Great Britain, after admission of their teachings; nor are they likely to be.

Add the millions of our fellow-creatures, truly so called, who, since the death of the vivisectional discoverer, have benefited by the discovery. Judge, then, between those millions that have been, together with the millions that will continue to be, blessed thereby,

¹ Human lives were saved by transfusion of the blood taken from a living beast, as in Lower's experiment, a consequence of Harvey's. *Nineteenth Century*, March 1882, p. 464.

and the one or two hundred of the brute-creatures sacrificed to gain such blessings.

The person sick is more grateful for the relief than the person sound for the food for which beasts are slain, skinned alive, or boiled alive. The thanks offered up from the bed of pain and sickness are not less heartfelt than the 'grace after meat.'

King James's Lord High Chancellor, in promotion and aid of physiological investigation, as a true basis of medical practice, commended 'the dissection of beasts alive, which, notwithstanding the dissimilitude of their parts, may sufficiently satisfy this inquiry.' And it did satisfy the inquiries of his great physiological and medical contemporary. Bacon might have carried through the legislature what Queen Victoria's Lord Chief Justice urges, 'complete and total prohibition of vivisection,' and have left the millions of his fellow-creatures moaning on their bed of sickness, deprived of that important guidance to right diagnosis and consequent treatment which has resulted from an intelligent 'feeling of the pulse.'

14. *Bestiarian repudiation of Hunter.*—

Passing from Harvey to his vivisectional successor, the case of subclavian aneurism recorded by Harvey was one of those which the healers then held to be incurable: the sufferings were palliated in the ways and by the narcotic means best known to the practitioner: but the patient was under sentence of death. Harvey knew only by inference and induction the communications, now called capillaries, between the arteries and veins; by which, agreeably with the great discovery of the circulation, the blood passed from the outcarrying channels from the heart to the inbringing channels to the heart. The cognisance of those intercommunicating vessels or tracts was due to the application of adequate magnifying powers; the properties of the capillaries were recognised by vivisectional experiment.

When the application of that physiological discovery to surgical practice was made, the Profession were emboldened—in faith of what the invisible collateral channels would grow into—to deal with such aneurisms as

the fatal ones in Harvey's practice. Pupils of Hunter hesitated not to tie the subclavian artery, the ectocarotid, the common carotid, the external iliac, the internal iliac,¹ nay, Cooper even ventured to put his ligature round the aorta itself; and if he did not, like his contemporaries, cure, he gave, in this bold procedure, some alleviation to the sufferer, and was blessed therefor. But of this result of vivisection I propose presently to speak in more detail.

Here, however, as in Harvey's work, the writers, paid and unpaid, on the part of the 'Victoria Street Society' meet the question by denial. 'John Hunter's own account proves clearly that that discovery had not been based—how in the nature of things it was essentially and obviously impossible that it should be based—in any way upon vivisection.' And again:— 'Hunter is said to have discovered his cure for aneurism by vivisection; but Sir Everard Home clearly shows that it was by pathological investigation that this was made.'²

¹ *Medico-Chirurgical Transactions*, vol. xvi. 1830.

² Frances Power Cobbe, in 'Four Replies,' &c., *Fortnightly Review*, January 1, 1882, pp. 97-98.

The 'notes' on his 'new treatment' which Hunter put into the hands of his assistant surgeon, with a view to help on the young brother-in-law in practice, include the following :—

'Mr. Hunter, having laid bare the carotid artery of a dog, for above an inch in length, having removed its external coat, and afterwards dissected off the other coats, layer after layer, till what remained was so thin that the blood was to be plainly seen through it, left the dog to himself. In about three weeks the dog was killed, and the parts examined; when it appeared that the two sides of the wound having closed upon the artery, the whole of the surrounding parts were consolidated, forming a strong bond of union, and the artery itself was neither increased nor diminished in size.'¹

The next therein recorded vivisection is as follows :—

'I laid bare the femoral artery of a dog about two inches below Poupart's ligament, for about an inch in length, and dissected off the coats till the hæmorrhage from the vasa vasorum was consider-

¹ 'Account of Mr. Hunter's method of performing the Operation for the cure of Popliteal Aneurism,' by Mr. E. Home, Assistant-Surgeon to St. George's Hospital. *Trans. Soc. Med. & Chir. Knowledge*, vol. i. 1793, p. 144.

able, and the circulating blood was distinctly seen through the internal membrane of the artery. The hæmorrhage soon stopped by exposure, the surface was wiped dry, and afterwards covered with a dossil of lint to prevent the sides of the wound from uniting. The dog continued to do well, and the wound healed up from the bottom. After six weeks the dog was killed, and the artery was injected. It was not enlarged or diminished, and its coats at this part had recovered their natural thickness and appearance.'¹

These experiments had reference to the operative part of the treatment suggested by the greater vivisectional discovery of the properties of the capillaries.

Then, again, the lover and searcher after truth may read :—

‘Not satisfied with the experiments on frogs, given by Haller in support of the opinion that weakness alone was sufficient to produce the dilatation, he (Hunter) resolved to try the result in a quadruped, which, from the vessels being very similar in their structure to those of the human

¹ ‘Account of Mr. Hunter’s method of performing the Operation for the cure of Popliteal Aneurism,’ by Mr. E. Home, Assistant-Surgeon to St. George’s Hospital. *Trans. Soc. Med. & Chir Knowledge*, vol. i. 1793, p. 145.

subject, would be more likely to ascertain the truth or fallacy of Haller's opinion.'

The practical point was this, whether an aneurism would follow a mere accidental dilatation or weakening of the coats, or would be the result of a morbid condition of the artery; and the experiments—

'Confirmed Mr. Hunter in his opinion that the artery, in cases of aneurism, is in a diseased state; and led him to believe that the disease often extends along the artery for some way from the sac; and that the cause of failure in the common operation arises from tying a diseased artery, which is incapable of union in the time necessary for the separation of the ligature.'¹

Whether John Hunter or Frances Power Cobbe best knew the methods of the discoveries in physiology and pathology by which the successful operator enriched his profession and blessed his species, may be left to those equal minds and simple lovers of truth who, having access to the reading-room

¹ 'Account of Mr. Hunter's method of performing the Operation for the cure of Popliteal Aneurism,' by Mr. E. Home, Assistant-Surgeon to St. George's Hospital. *Trans. Soc. Med. & Chir. Knowledge*, vol. i. 1793, p. 145.

of the British Museum, and requiring the volume of the 'Transactions' above quoted, may compare my 'Extracts' and the Bestiariane's denials with the original.

Professional friends may deem all this a waste of valuable time ; and true it is, that I have materials enough to occupy the brief remnant of any power to such end in more direct relation to the advancement of science.

It is not a pleasant side of human nature to dwell upon, that those dependent upon their professional practice, who devote their small leisure to the bye-researches which give increased knowledge and power, lose thereby. It was the case with Harvey : it was the case with Hunter. The latter died 10,000*l.* in debt, incurred in the building and the specimens which filled it. The sole security for the debt was the Museum. When, seven years later, the nation acquired that Museum for 15,000*l.*, the debt was paid, and the residue sunk in purchase of an annuity for the widow. In the meanwhile the accomplished lady who contributed the words to

some of Haydn's songs—e.g. 'My mother bids me bind my hair,' etc.—had received pupils for education, and added literary work to her means of support.

The labours of Hunter in comparative anatomy and physiology were not of a kind to commend him to the public as a practitioner. His last pupil and assistant in his experiments and dissections used to tell of a brief and characteristic comment of his master, too emphatic to quote, when he was told of the remark of a fashionable physician who had called in 'Leicester Fields' to see Hunter respecting some case—'I found poor dear John Hunter dissecting a beetle!' The preparations may still be seen in which the anatomy of insects is displayed with Hunter's usual skill. Still such excursions out of the practical tract were not to be paraded before the public.

Hunter felt no call to obtrude upon possible patients the experiments which he may have made in Richmond Park touching the 'growth and shedding of stags' horns;' but the preparations exemplifying the experiments

remain and will speak for themselves while the Museum lasts, and the allusion to the physiological fact discovered by the vivisection is sufficiently plain :—

‘Experience has shown that all the modes hitherto practised are exceedingly precarious, being rarely attended with success, and the death of the patient being commonly a consequence of a failure of the operation ; a circumstance which has led some surgeons of great eminence to prefer amputation of the limb in all such cases.

‘It appears from these cases that surgeons have laid too much stress upon the supposed necessity of large collateral branches to ensure the success of this operation ; an opinion which must have arisen from “anatomical knowledge.”’¹

That is, from not finding in the dead subjects such branches.

Their substitutes first became known from ‘physiology,’ i.e., by vivisectional experiments, made originally without any view to surgery, but to explain the process of the annual formation and shedding of the horns of deer. Of these experiments was

¹ ‘Mr. Hunter’s Method,’ &c. *Trans. Soc. Med. & Chir. Knowledge, tom. cit.* p. 143.

the one which revealed to Hunter the condition of success which anatomy alone had failed to give. Among the many preparations in Hunter's Museum illustrative of the singular phenomena, the comprehension of which had baffled the ingenuity of his predecessors, from Redi downwards, are the successful injections of the enlarged capillaries which restored the vascularity of the 'velvet' in the vivisected deer.

Among the 'surgeons of great eminence' the one especially alluded to was Mr. Pott, of Bartholomew's Hospital. Another contemporary was Mr. Bromfield, who had also published his views on the matter. Hunter, in his 'Lectures on Surgery,' quotes the following from Mr. Bromfield :—

'The injecting of parts in dead bodies having shown that in particular subjects the branches sent off have now and then formed anastomoses with other branches given off lower down, has led to very extravagant notions of the smaller branches being always able to carry on the circulation, and an extravagant proposition has been suggested by some people to tie up the principal trunk of an artery in the extremities.'

In reference to this, Hunter remarks, that 'the some people' was himself.

Mr. Pott had also observed—'that the want of collateral branches of sufficient size to carry on the circulation is another powerful impediment to the operation.' That is, Hunter's new one : then Hunter proceeds :—

'How early the operation may be performed I do not certainly know ; but my opinion is that it may be done as soon as the aneurism is known to exist. By some' (i.e., Bromley and Pott) 'it has been recommended to permit the disease to exist for some time ; first, because, say they, as the circulation becomes obstructed a freer communication will take place between the branches above and below.'

Although a non-professional man—one ignorant of both physiology and surgery—may be excused from poring over the pages of the controversial pamphlets, in the 'Lectures' of Hunter, or the 'Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge,' yet the exigencies of the 'Society for the Protection of Animals from Vivisection' impel their scribes, salaried or otherwise, male and female, to 'rush in.'

In a 'Pamphlet' issued from the 'Office of the Society, 1, Victoria Street, London, S.W.,' 8vo., 1881, the writer states :—

'I have shown that with Hunter's brilliant discovery, in its original inception, vivisection as a matter of fact had, and as a matter of science could have, nothing whatever to do ; it was actually directed towards dispensing in a great measure with the aid of that collateral circulation, to the imaginary accidental discovery of which by Hunter you have erroneously attributed the origin of his invention. As first designed, the tying of the femoral artery by Hunter's plan was simply, like the tying of the popliteal on Anel's, a first step in the operation, which was only completed by the opening and emptying of the aneurismal sac.'¹

The quotation, which I need not characterise, is here given to show the mode in which 'subscribers to the Society' are instructed as to vivisection. Miss Cobbe affirms that it was 'the brachial arteries which Anel tied.'²

An obvious mode of dealing with a dilated artery, progressively enlarging, was

¹ *Hunter and the Stag, &c.*, p. 18.

² *Fortnightly Review, ut supra*, p. 100.

to stop the flow of blood either entering or quitting the aneurismal swelling. Guellemau (1550) tried his master's (Paré's) plan by ligature ; Anel, a century after, did the same : Dessault repeated the operation in Hunter's time ; they had no followers. Each and all used the wrong kind of ligature and put it in the wrong place : result was, especially in the ' popliteal ' cases, and where the swelling was not the effect of a wound of a healthy artery, fatal ; the sac suppurated, burst, and so the patient was relieved of his sufferings by death. Pott, therefore, proposed amputation.

The true method of treatment was based upon the knowledge that the minute anastomosing vessels of the limb were capable of so enlarging as to suffice for carrying on the circulation to the parts beyond the point at which Hunter proposed to tie the main artery. This physiological fact was ascertained by vivisection, and to vivisection alone is due the benefits to poor humanity which ensued and will continue to future generations. The reception by his contem-

poraries of Hunter's new operation has been given.

Again I respectfully ask the Legislature to weigh the thousands of his fellow-creatures cured, against the one buck slaughtered in their behoof.

Bestiarians would do well to test every assertion made by their paid or unpaid writers by turning to the authorities exposing their nature; and, when the assertion may be accompanied by a reference, to compare it with the text of the 'Work' which is cited as the authority against vivisection.

In the performance of my duty at Folkestone, I limited the instances of the benefits of vivisection to a few prominent ones known to my professional hearers, and intelligible, I hoped, to the rest of the auditory.

When I was charged with the duty of making a 'Descriptive Catalogue' of Hunter's preparations in the Museum purchased by Parliament, I was surprised at the number which had been afforded by the fallow-deer—thirty-seven in the 'Physiological

series,' besides the 'Dry preparations ;' and I was especially impressed by the beauty of those exemplifying, by successful injections, the anastomosing cervico-cranial vessels and vascularity of the 'velvet,' or formative organ of the antler. Then it was that I learnt from the last house-pupil or apprentice of John Hunter the circumstances and researches which had led to their accumulation, the chief of which were borne in perfect memory by him who had assisted in the vivisections. Here, as on similar occasions, Mr. Clift lamented the laxity which had permitted Everard Home, on the transfer of the 'Collection,' to take possession of, and remove, all the manuscript documents which Hunter had left in aid of the task, for the performance of which Home professed to require the manuscripts ; but which duty he never did perform. What was worse, when called upon by the trustees of the Hunterian Museum, whose patience, after a quarter of a century's expectation and promises, became exhausted, to return those manuscripts, he replied that he had burnt them.

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Lauder Brunton, F.R.S., *Nineteenth Century*,
 1882, p. 479.

In them, I doubt not, would have been found, briefly noted, as was the way with Hunter, the guiding circumstances under which all the cervine preparations had been made. But how few there might then be to sympathise with such research, with its aim, or the results !

A cow never sheds its horns ; a stag sheds them every year. Why, or how should it do so ?—questions that may have crossed an inquiring mind. But, even in the present age, there are, I regret to say, who, when told that the answers to the ‘why’ and the ‘how’ can only be got by vivisection, cry aloud, ‘I will have none such!’ A deer may be hunted to death ; a bullet may be sent tearing through its hide and flesh, crashing its bones and lodging in its vitals :—‘I have nothing to say to that ; but will have no incision, however simple or short, made on the living beast out of mere curiosity. Venison we must have : we can do without information !’¹

¹ This, however, may be found by the curious reader in a book published by Messrs. Longmans, entitled *Anatomy of Vertebrates*, 8vo. vol. iii. p. 628.

15. *New medicines and relief of symptoms.*

—In the foregoing pages, instances of the power of curing disease through knowledge acquired by vivisection have been submitted ; but that of alleviation of distressing symptoms in maladies over which medicine has not yet got the complete control and power of removal may be legitimately cited in the present argument.

This may meet the eye of some who have known and felt the misery of witnessing a beloved relative or dear friend agonised by symptoms which an experienced physician and physiologist thus graphically describes : ‘ The occupant of the sick bed cannot lie down in it, but is propped up, gasping for breath, gazing piteously, with livid face, scarce able to move the swollen limbs, and when overpowered by sleep, has scarcely closed the eyes before roused with a start by a feeling of impending suffocation.’¹

It lies with the Bestiarian to disprove Dr. Lauder Brunton’s statement that the healer’s

¹ Dr. Lauder Brunton, F.R.S., *Nineteenth Century*, March 1882, p. 479.

knowledge of the cause of this, and of the alleviative remedy, is due to vivisection.

‘As the result of experiments upon animals he knows that the lungs are not much in fault, and that a certain sound in the beat of the heart, a sound ascertained by means unknown to Harvey, but a legitimate consequence of his vivisections, indicates a definite disease of one of the valves of the heart ; and, as the result of other experiments upon animals, the healer is able to say with certainty what condition of the patient’s organs causes his distress. Other experiments have shown that retarded circulation through the lungs, from interference with the heart, will produce shortness of breath. Partly from other “vivisections,” and partly from the ravages of disease upon man himself, he knows that the swollen dropsical legs and feeble pulse are also dependent on the same condition.’¹

The time is not so remote when the experienced physician, called in to such a case, would have referred the ‘want of breath’ to ‘disease of lungs,’ and have prescribed accordingly. The unsuccessful result, also, would have been charitably held to be inevitable.

In the actual phase of healing knowledge

¹ Dr. Lauder Brunton, F.R.S., *Nineteenth Century*, March 1882, p. 483.

a medicine would be exhibited, of which the alleviative effects upon the panting sufferer would be hailed by him with astonished blessings, and by the friends about the bed with grateful surprise.

The physician is able to do this, first upon Harvey's basis already alluded to ; then by a knowledge of the effects which morbid alterations of the heart's machinery produce, 'also derived from experiments upon animals;' next, 'from a knowledge of the indications of these changes, also derived from experiments upon animals.' But he has not yet attained his end—the cure of his patient. For this 'he is again indebted to experiments upon animals.'¹

I fear that it is in vain, and with sorrow I express it, to expect that the 'Victoria Street Society for the Protection of Animals from Vivisection,' or a committee including the titled members thereof, will do, what in common fairness might be expected by Humanitarians, and what it may be hoped a

¹ Dr. Lauder Brunton F.R.S., *Nineteenth Century*, March 1882, p. 483.

committee of the House of Commons will do, should such be appointed to consider the amendment of a former 'Act,' by a 'total abolition of the practice of vivisection.' It is, to call before them the Licentiate of the Royal College of Physicians of Edinburgh, who is also a member of the Royal College of Surgeons of England and a member of the Society of Apothecaries, together with his Associate, who is a member of the Royal College of Surgeons; both of whom, under the title of 'Doctor,' moved and seconded 'That vivisection is a scientific blunder and a moral offence, and ought to be totally abolished.'¹

Messieurs Gibson and Berdoe should be brought to submit to such 'Parliamentary committee' their proofs that the statements by Dr. Lauder Brunton which I have quoted² are untrue or unfounded; including the one which affirms that the physician, administering the appropriate remedy in the case described,

¹ *Report*, &c. *ante*, p. 5.

² Dr. Lauder Brunton, F.R.S., *Nineteenth Century*, March 1882, p. 483.

is, for his power of cure, 'again indebted to experiments upon animals;' ¹ more especially for those instituted by Professor Traube, yielding, with the nature of the drug, its proper dose, the exact knowledge of its mode of action, and the cases to be selected for its exhibition or to be avoided.

In affections of the lungs, e.g., the sad malady due to tubercle, commonly known as 'consumption,' 'some of the most distressing symptoms are the profuse night-sweats, and the painful prostration which accompanies them.' ²

Prior to the experiments of Luchsinger showing that insufficient aëration of blood will cause sweating, and to those of Rokitanski proving that strychnine increases the respiratory movements, the physician had no clue to any relief of such symptoms. The proper dose of the experimentally discovered remedy being administered, 'the sweats cease and the prostration disappears.'

The Humanitarian rejoices with the rela-

¹ Dr. Lauder Brunton, F.R.S., *Nineteenth Century*, March 1882, p. 483.

² *Ib id.* p. 484.

tives of the poor sufferer, whose grateful thanks the administrator of the remedy also receives; but what shall we say to the Bestiarian prevention of such blessing, temporary though it may be!

And to whom does the Pharmacopœia owe the introduction of the remedy? To Magendie. Strychnia was one of the first drugs introduced into medical practice through vivisections.¹ And here, as in other blessings to humanity gained by physiology, I would take leave to remind the equal Legislator that the result, once proved and established, and accepted as a power in practice, is no longer needed, nor has it ever been shewn to be wilfully sought for by repetitions of the demonstrative experiments. The beasts have perished, and there an end. But when may the numbers of our suffering fellow-creatures be counted out who will continue from generation to generation to bless the discoverers of the means of relieving or annihilating their torments!

¹ Dr. Lauder Brunton, F.R.S. *Nineteenth Century*, March 1882, p. 484.

16. *Vivipuncture*. The seeds of a plant transplanted into another, perhaps better, soil, may grow, in the course of such transplantings to something other, usually better, than the wild ancestor. Bitterness and toughness of root may be changed to softness and sapidity; the hurtful medicinal herb may become an edible and nutrient one; and this is said to be due to 'cultivation.'

The variolous micro-organism, the efficient cause of 'small-pox' in the human kind, transplanted into the bovine frame, likewise loses somewhat of its lethal properties. If the variolous 'bacilli' do not kill, they leave a condition hostile to admission of other immigrants of their kind. So the milder variety of bacilli, provided by change of soil or 'cultivation,' after pervading as 'cow-pox' the human frame, leave it in a defensive state, impregnable, or nearly so, to the invading 'bacilli' of 'small-pox.'

To profit by this discovery of the relations of micro-organisms to other human maladies known as 'anthrax,' 'struma,' 'tubercle,' &c., bacilli must be 'cultivated,' be inoculated, or

sowed, into the living bodies of beasts or birds—rabbits, guinea-pigs, cats, dogs, poultry, &c.—occasionally with fatal results, and every humane person must feel for the pains preceding dissolution. But, if the sentiment be guided by right reason, the gains to humanity, the proportion of lethal sufferings so abolished or prevented, will be weighed.

This experimental as it is a righteous way of contending with disease guides the educated members of the Veterinary College, as it does those of the Colleges of Physicians and Surgeons; the vivisectional benefits have been and are likely to continue to be reciprocal. The following, from the present accomplished Director of our Institution for the healing of beasts, may excite a thrill of hope in the breast of every member of a family ‘consumptively’ disposed :—

‘Tuberculosis, or consumption in cattle, has been demonstrated by many series of experiments on living animals to be not only contagious and inoculable, but to be communicable.’

This is a first step as in the victory over small-pox. Mr. Fleming proceeds :—

‘Consumption in its various forms is painfully common in mankind, and the relationship between the human and the animal malady is a problem that presses urgently for solution. This can only be afforded by careful *observation* and *experiment*, the two indispensable methods of progress in natural science.’¹

The nature, extent, and, were it not for faith in progress, I might say perfection, of the researches to this end, are shown in the first volume of the ‘Transactions of the International Medical Congress,’ pp. 290–341. The names of the eminent physiologists and physicians who communicated and discussed the causes, conditions, and treatment of the several maladies now under a control they never had before, will ever reflect honour on and claim the gratitude of their respective countries. I limit myself here to a notice of one who, since the meeting in London of

¹ ‘Vivisection and Diseases of Animals,’ *Nineteenth Century*, March 1882, p. 477.

1881, has received the public testimony of a trusted British philosopher.

The method of research by which Dr. Koch discovered the lethal element of the 'contagion of splenic fever' is defined by our own consummate experimenter, Tyndall, as characterised by 'penetration, skill, and thoroughness;' and his processes have met with due and appropriate recognition by the German government. Instead of permitting prosecution of the vivisector at the suit of ignorance, prejudice, and inhumanity, Dr. Koch has been promoted from a modest country practice in the neighbourhood of Breslau to the post of 'Government Adviser in the Imperial Health Department of Berlin.'

There he has devoted his experiments to advance a knowledge, in the way indicated by Villemin in 1865, of the nature, cause, and prevention, with probable power of cure, of a tubercular disease which, in point of fatality, exceeds all others. Of what with us is vaguely known as 'consumption,' the Berlin statistics assign one-seventh of the deaths to that tubercular disease. Among the pre-

ventive warnings Dr. Koch points to the grave danger of inhaling air in which particles of dried sputa of consumptive patients mingles with dust of other kinds ; this being determined by experiments on a rabbit. The medical profession gratefully receives and studies with humane interest the ' Report of Medical-Adviser Koch,' submitted by him to the ' Physiological Society of Berlin' on March 24 .of the present year. An outline of its important teachings has been benevolently given by Professor Tyndall for the consolation and hopefulness of the many estimable families in Great Britain now saddened by the prospect, or by the access, of tubercular affection of the lungs in, as is frequently the case, the most engaging and beloved member of their family.

Such hope, such prospect, of prevention and cure, the declaimers, male and female, of ' the Society for the Total Abolition of Vivisection ' would darken and dash aside.

The following are the terms in which our trusted man of science testifies to the achievement of his German fellow-searcher ;

‘It would be mere impertinence on my part to draw the obvious moral from these experiments. In no other conceivable way than that pursued by Koch could the true character of the most destructive malady by which humanity is now assailed be determined. And, however noisy the fanaticism of the moment may be, the common sense of Englishmen will not, in the long run, permit it to enact cruelty in the name of tenderness, or to debar us from the light and leading of such investigations as that which is here so imperfectly described.

‘(Signed) JOHN TYNDALL.’¹

This leads me to pass from the benefits to mankind through the labours of humanitarian physiologists to those derived from vivisections for the benefit of beasts. I have to express my grateful obligation to the experienced and accomplished director of the Royal Veterinary College, in London, Mr. George Fleming, who has concisely and clearly described some of those benefits in his ‘Article’ above quoted.

The causes of contagious diseases, like those discovered by Lister to be the causes

¹ *Times*, Saturday, April 22, 1882.

of suppurative and gangrenous consequences of operations, are the minute organisms, endowed with marvellous powers of multiplication, above referred to. Their discovery as lethal agencies in diseases of beasts, Mr. Fleming states, 'could only be determined by means of experiment on living animals.'¹ On this proposition supporters of the Bessiarian Society have to judge between the adverse assertions of their paid and unpaid writers, and the experienced practitioner mainly responsible for the prevention and cure of the diseases in question.

There may be grounds for Lord Coleridge's taunt—'As far as I know the Church of England never raised a finger, and very few of its bishops ever raised a voice, to put down our own slave-trade or set free our own slaves.'² But to such taunt they are not amenable as regards the subjects of physiological experiment.

True friends to the Church—and among

¹ 'Vivisection and Diseases of Animals,' *Nineteenth Century*, March 1882, p. 471.

² *Fortnightly Review*, February 1, 1882, p. 236.

these there are Healers of whom the medical profession is justly proud—would respectfully urge that in lending their influential social aid to the agitation for total suppression of such experiments, their ‘most’ and ‘right’ reverend lordships should limit it to the cases to which alone an Act of our Legislature can apply. Common justice and honesty ought to prevail with archbishops and bishops, and I might add, cardinals, to ascertain, as when a charge has to be proved before a jury of our countrymen—the fact of the denounced experiment having been performed in her Majesty’s realms, and by an experimenter a subject of her Majesty,—that the grounds of such charges and denunciations are plain and sure,—and that such experiments are useless and their perpetrators condemnable.

In a ‘Statement’ issued under the sanction of His Grace the Archbishop of York, the committee of the Society (*Ante*, p. 5) assert :—

‘Better is it, in the supreme interest of man as well as brute, that all the vaunted benefits to be won

by vivisection (were they tenfold greater than they are ever likely to be) should remain unattained to the end of time, rather than that by familiarity with the impassive pitilessness of the physiologists our race should lose those sentiments of mercy and sympathy which are of more worth than a million of the facts of science.' ¹

To this quotation may be appended another from the humanitarian quarter :—

'In the old story of the Good Samaritan the Priest and Levite who saw the unfortunate traveller lying naked, dirty, and covered with blood upon the road, and who carefully passed by on the other side, away from the disgusting object, would no doubt regard with scorn, as possessing a coarser nature, the Good Samaritan, who not only approached the sufferer, but, prototype of antiseptic surgery, poured oil and wine into the wounds, in spite of any temporary pain which the applications might occasion.' ²

The 'speeches,' the 'addresses' at public gatherings, the 'articles' in monthly and fortnightly reviews, the weekly literary services of the 'periodical' published under

¹ *Fortnightly Review*, January 1, 1882, p. 102.

² T. Lauder Brunton, M.D., F.R.S., *Nineteenth Century*, March 1882, p. 479.

the auspices and at the cost of the 'Society for the Protection of Animals from Vivisection,' combine and concur in promotion of a further enactment of the Legislature for 'the total abolition of the practice of vivisection in this country.' That is their main if not exclusive aim.

Whatsoever, therefore, is alleged by speakers or writers to that end will be held, and logically can only be understood, to apply and refer to the physiologists and physiological practitioners of this country.

Those of other countries cannot be affected by a British 'Act of Parliament.' References to alleged procedures in those countries are nevertheless made on the assumption and assertion that the same or the like are carried on here: so far as such statements may influence legislators, they are made ostensibly with the aim of suppressing 'deeds disgraceful to humanity,' alleged or implied to be perpetrated by professional men, engaged in preventing, mitigating, or curing disease, as exercised by practitioners in our own country.

Their characters, their grounds for public estimation, are conditions of existence, the assaults on and attempts to destroy which should in common honesty, if not humanity, be based on statements of proved facts.

Those who were favoured with the friendship of the late estimable 'Father Sibthorp' well know that he would have taken due and conscientious pains in sifting the evidence affecting the characters of countrymen engaged in, and devoting such leisure as healing duties permitted, to the advancing, by physiological experiments, the power of relief and cure of maladies affecting the human body. The analogy of such aim and work to the Samaritan's and to his own, in addition to that which unspoiled conscience urges on every honest man, would have compelled that estimable priest to premise plainly and particularly the evidence on which he felt himself justified in publishing to the world such a definition and denunciation of his countrymen's methods of gaining healing powers as the following: '*A detestable practice not attended with scientific results.*'

' They had been hoodwinked by the legislation on the subject, and believing that it had produced no effect, he maintained that what they should now contend for was *the total abolition of the practice of vivisection*. While the torments of animals were real, the benefits to humanity were altogether conjectural.' ¹

Upon this I regret to be obliged to remark that the Rev. H. E. Manning, like the physicians and physiologists he assails, is, or was, a subject of Great Britain; and he must know that his Sovereign is the sole legitimate source of 'titles of honour' in this country. Comment on his assumption of 'Eminence,' 'Cardinal,' 'Archbishop of Westminster,' or of any part of England, would not here have gained a place, were it not that these titles are flaunted before the public in bestiarian journals and reported speeches at 'annual meetings' to attract the attention and captivate the belief of the ignorant and unwary, in such unmitigated and unproven abuse of humanitarians.

¹ *Report of the Annual Meeting of the Society, &c., ante, p. 6.*

When Father Sibthorp was tempted with the 'hat,' his reply was '*vade retro*.'

Given the discovery of the cause of 'cholera of poultry' (*choléra des poules*) the physiologist who puts the poisonous 'microbe' into the body of a healthy hen may plead an aim which the Archbishop of York,¹ on second thoughts, might define in less uncharitable terms ; the result being the saving of *thousands* of these poor feathered bipeds from a painful and loathsome malady ; at the risk of causing it in a single *one*. And besides the good to them the results to mankind are, also, of the nature of a benefit or blessing ; for example, in the aid to the agriculturist in the payment of rent, and the increase of wholesome, we may say luxurious, meat to those for whom poultry are reared and fed.

His Lordship, the Right Rev. Bishop of Winchester, in his turn, asserts : ' We had no right to torture the creatures of God for the

¹ I may refer his Grace to the 'Address' of Professor Pasteur to the Inter. Medical Congress, August 8, 1881, *Transactions*, vol. i. p. 85.

sake of any supposed benefit we might derive from doing so.'¹ Now Pasteur's experiment, had it not succeeded, might have been stigmatised as 'torture.'

But there are other maladies affecting beasts of much greater value to human beings. Those maladies are known, with dread to the breeders, as 'splenic fever,' or 'anthrax.' In France, sheep to the value of 20,000,000 of francs were thereby lost annually. In Russia, 100,000 horses were reported to have perished in the year 1837. In 1860 out of 18,883 cattle attacked by this disease, 13,104 succumbed. Similar statistics might be multiplied. According to the Bestiarian ethics the wilful introduction of the virus into a living and healthy horse, cow, or sheep, 'for merely a conjectural result,' is a 'pandering to curiosity without doing anything for science.' His Eminence the Cardinal Archbishop of Westminster asserts it to be 'a detestable practice not attended with scientific results; while the torments of ani-

¹ 'Antivivisectional Address at Southampton,' October 16, 1878, quoted by Miss Cobbe, *loc. cit.* p. 102.

mals were real the benefits to humanity were altogether conjectural.’¹ Some excuse for the quoted utterances of dignitaries of the Christian Church may be proffered, in the fact that, at the meeting of the ‘Society’ so addressed, a ‘Dr. Gimson moved, “that vivisection is a scientific blunder and a moral offence, and ought to be totally abolished ;” and a Dr. Berdoe seconded the resolution, which was adopted.’² The names of these representatives of the medical profession being at that date unknown to me, I referred to my ‘Royal Blue-Book’ of 1881, for their addresses, but they were not there. In the ‘Medical Directory’ I found their qualifications as quoted above (p. 178). Both, however, receive the title of ‘doctor’ from the ‘Victoria Street Society for the Protection of Animals from Vivisection.’ The connection of either name with physiology, experimental or general, with anatomy, or other science, has not come to my cognisance.

Returning to the annals of those helps to

¹ *Report, &c., ante*, p. 6.

² *Ib. ib.* p. 7.

healing, it is recorded that, up to the 1st of October, of 160 flocks of sheep comprising 58,900 animals, Pasteur had vivisectionally inoculated 33,576. Before the experiment the loss in all the flocks had been 2,986. When the effects of the experiment were at an end 260 sheep died in the group of 33,576 sheep which had been operated on.

‘When the effects of inoculation were achieved in the first group the mortality from the disease fell at once to 5, and then ceased. At Alfort a hundred sheep were protectively inoculated, and subsequently (for the place stinks in the nostrils of Bestiarrians) received a sufficient quantity of crude virus to cause death to animals not so protected, and yet not one, being inoculated, died. The value of this new method cannot be exaggerated, even if it were applicable to anthrax alone. By means of this discovery, made through experiments on living animals in the laboratory, this scourge, hitherto irrestrainable and incurable, is now completely under the control of man, all over the world. This discovery is even greater than that of vaccination, inasmuch as that was only applicable to one disease, small-pox; whereas the method can probably be applied to many contagious diseases besides anthrax.’¹

¹ Fleming, *loc. cit.* p. 474.

Had England the honour of claiming—as her son the distinguished and beneficent physiological discoverer of these preventive measures, L. Pasteur must have absorbed the available time of the officials of the ‘Home Department,’ by the thousands of his applications for Parliamentary sanctions for vivisectionally puncturing and introducing morbid virus into the thousands of domestic cattle so experimented upon. A wholesale grant of condonement might, indeed, have been issued; but it might also have led Sir Eardley Wilmot, M.P., or Mr. R. Reed, M.P., to put an awkward ‘question’ to the ‘Home Minister,’ in the ‘House.’ For most certain it is that ‘every step in this grand and fecund discovery was accomplished by experiments on animals, and in no other way could it be effected.’¹

The Bestiariæ has small compassion for one of her own species. The veterinary surgeon risked much in giving publicity to his own convictions as to the use and need of vivisection. I quote the following :—

¹ Fleming, *loc. cit.* p. 471.

'The Dogs' Home and Vivisection.—On Saturday the annual meeting of the members and friends of the Home for Lost and Starving Dogs was held in the offices of the "Society for the Prevention of Cruelty to Animals."

'Sir Francis Burdett, Bart., presided, and was supported by the Baroness Burdett-Coutts, Miss Cobbe, Sir Alexander Malet, Professor Pritchard, Mr. Fleming, President of the Royal College of Veterinary Surgeons, &c.

'The "Report" stated that in 1881 there were 16,735 dogs received into the Home. Of these 15,621 were received from the Metropolitan Police, 63 from the City Police, and 51 from private individuals; 5,548 had been claimed and sold during the year; 3,493 dogs were claimed by their owners. A detective had been employed to watch the destination of purchased dogs to prevent them getting into the hands of the vivisectionists. Subscriptions and donations amounted to 1,053*l.*, and the sale of dogs, &c., produced 1,744*l.*

'The "Report" was adopted.

'On a motion of re-election and of thanks to the committee, Miss Frances Power Cobbe moved, as an amendment, that, as Mr. G. Fleming had published in the "Nineteenth Century" an article in favour of vivisection, his name should be omitted from the committee. Miss Lloyds seconded the amendment.

‘Mr. Fleming defended the “article” in question, stating that he had shown in the “article” that animals, not less than human beings, were benefited by improvements in pathological experiments. He contended that in rabies these experiments were most important.—Professor Pritchard said there was not a line in the “article” which could prejudice the public against the “Dogs’ Home;” and Mr. Colam, Secretary of the Society for the Prevention of Cruelty to Animals, asserted that there was not a word in it in favour of vivisection.—The Baroness Burdett-Coutts said she attended the meeting because she understood the question of vivisection would be before it. She had a strong repugnance to the “Act” being placed on the statute-book. There must, however, be held to be a great difference between pathological experiments and vivisection. In conclusion, the Baroness spoke against the amendment; but said it was highly important that the public should not imagine that the dogs in the “Home” were subjected to vivisection. The amendment was lost, and Mr. Fleming was re-elected, only ten votes in a crowded meeting being recorded against him. The meeting closed in the usual way.’¹

It is generally and gratefully recognised that the action of the ‘Society for the Pre-

¹ ‘Report of the Meeting,’ in the *Daily News* of March 13, 1882.

vention of Cruelty to Animals' has been uniformly applied to its legitimate object. The treatment of beasts in relation to the food, clothing, and healing of mankind has had the consideration marked by wisdom and common sense. On the other hand, the nature of some of the individuals associated for the promotion of cruelty to their species was instructively exemplified at the Meeting above reported on.

It is to be hoped that the attempt to deprive a 'healer of animals' of his means of livelihood will fail. The skill and humanity of the President of the Royal Veterinary College are too well and too generally recognised to be affected by the railing of a scold.

16. *Use and Abuse of Poisons.*—I would select, under the present head, from the instances of the relation of such experiments on beasts to the good of man, the following.

There are cases of distressing maladies favourably affected by contracting the arterial vessels and relieving the cause of œdema, which is 'blood-pressure on the capillaries.' Such influence of substances on the arteries as, for example, the 'ergot of rye,' has been

ascertained by exhibition or introduction of the poison, an experiment which might have been made on either the human or the bestial subject. When ascertained in the latter way, so much—and so much only—of the poison (and all drugs may be so regarded) as will effect the requisite diminution of the arterial area is now administered, and relief is given to the myxœmal sufferer. It is a means of relief altogether unknown and unsuspected prior to the vivisection. Accordingly, humanitarians prefer and encourage such experiments : bestiarrians would perform them on the higher kind of animal, or allow him and her to die unrelieved. Nay, they interpose their ignorant and unscrupulous assertions, in public utterances, and in writings, to prevent or punish such attempts to let in healing light, save on the bodies of their own species.

Those, however, of the animal kinds 'of less value' lend themselves also to the prevention of the poisoning of human beings, of which the fatal result is, with scarcely an exception, preceded by intense, more or less prolonged, torment.

The advance of chemical science has increased the number of deadly agents, has placed new and subtle lethal substances at the command of the poisoner, has added also to the facilities of the exhibition of the poison and to the difficulties of its detection. But, happily for humanity, the science of chemistry, in combination with that of experimental physiology, has, at the same time, added to the power and certainty of detection.

The symptoms of the several deadly substances are diverse and well-marked; those of laudanum are distinct from those of strychnine, those of arsenic from those of corrosive sublimate, those of phosphoric acid from those of aconitine. And these several series of specific disturbances of the healthy functions and vital actions have been experimentally proved to be the same in the lower members as in the highest of the mammalian class; and, in the commonly obscure conditions of the murder, such test, corroborative of, or supplementary to, analysis, will be called for ere the verdict of a jury be pronounced.

This aid from physiology is a great gain in the demonstration of the kind of poison producing such series of symptoms as those which finally terminate hours of unendurable lethal human torture.

Such subtle poisons are recognisable by other senses than that of sight. When this gives no warning taste supplies it, and the bitterness of monkshood may make the careless child spit out the mouthful of root that tempted it. But when the poisonous principle of *Aconitum napellus* is extracted, withdrawn from every other constituent of the plant, its effect on the tongue is concentrated, taste becomes a surer evidence of the poison than sight. Nay, the invisible atom of aconitine proclaims its presence by unmistakable signs. Given its contact with the tip of the tongue—and our humanitarian Experts do not shrink from such tests—a burning, tingling sensation ensues, with a peculiar sense of numbness of the part, followed by salivation, by a feeling as of swelling at the back of the throat, with irresistible expectoration, and a seared sensation over the surface of

the tongue, as if hot iron or some caustic had been passed over it; the peculiar burning sensation may extend down to the stomach, exciting to vomit; even in the tentative gustatory experiment the pain on the tongue endures for hours.

The presence of aconitine recognised by post-mortem analysis elucidates the nature and cause of the symptoms, ending in the death of the tormented victim of the poisoner.

This stage of the inquiry suggests, nay, imperatively calls for, another test. Given aconitine to a beast, will it show the same symptoms and results as in a man?

Here, therefore, comes a case as between Bestiarian and Humanitarian. Neither party can doubt but that the power of detecting the subtlest poison which a pharmacist might select, would act as warning against its wilful and wicked administration. Palmer selected 'strychnine,' Lamson 'aconitine.'

Organic chemistry may add synthetically to the number of such subtle poisons, but, happily, analysis and vivisection keep pace; and so the antidote, a sense of the possibility

of detection, may deter the poisoners, and act as bane to a murderous design.

In a recent instance of the vivisectional test, the introduction of aconitine into the body of a living healthy beast was followed by the usual signs in the nervous system, in the nitrogenous tissues of the body, and in the termination of the animal's sufferings by paralysis of the heart's action. In the aim of this vivisection, humanitarian sympathies were more strongly excited for the poor schoolboy than for the mouse.

The latter threw additional light on the case by contributing detection of the lethal substance exhibited, through the chemical method, in the viscera and urine of the poisoned beast; and this important testimony was forthcoming when the poison introduced was probably less in quantity than that which caused the sufferings and death of the human subject. For such is the power, precision, and exquisite skill of the organic analyst that the 200th part of a grain of aconitine can be detected, demonstrated, and sworn to.

Now, I deem it to be a fair, reasonable,

and therefore acceptable inference, that proofs of the power of detecting the exhibition, with murderous intent, of the rarest, subtlest, latest-discovered lethal element, must, with the publicity given to all the particulars of such cases, be a deterrent of repetitions of the crime—an additional safeguard to our own species ; again to be gratefully acknowledged by the Humanitarian.

The analogy of the symptoms of the minute dose of aconitine administered to the beast to those of the poisoned man, and the determination of the same poison in the post-mortem scrutiny of both man and beast, spoke indisputably of the vital importance of the vivisectional method, of which the results were detailed, under oath, at a late trial.

One of the Experts officially called upon to make the experiment felt compelled, in duty to society, to subdue and smother those sentiments, that self-respect, which a recent ' Act of the Legislature ' excites in the breast of every gentleman.

For the physician, the physiologist, even the ' ordinary coarse rough man, the common

human being, of whom the bulk of the medical profession is made up,'¹ in supplicating a 'Home Secretary' for official sanction and condonement of an operation on a brute, cannot but feel himself degraded thereby to the status of a social criminal, or of a convict in whose favour intercession has been made for remission of penalty. No matter how plainly, how indisputably, the vivisector has the benefit of his fellow-creatures and the public good in view, he is proclaimed by Bestiarians to the world to be meditating 'an act so revolting to the sense of civilised mankind,' or to some, at least, of his countrymen and countrywomen, 'as to subject him to their just hatred and scorn'—sentiments which have compelled them to agitate for, and appeal to the Legislature to grant, special protection to their outraged sensibilities, a protection which, though not yet stretched to the extent for which the outcry is made, has, nevertheless, done so

¹ Chief Justice Coleridge, in the *Fortnightly Review* for February 1, 1882, pp. 231-32. His Lordship's aspersion of an individual (p. 229) is of small moment compared with this wholesale insult to my profession.

much for 'the Society's'¹ special gratification as to place the scientific experimenter below the butcher, the gelder, the gunner,² and all other vivisectional classes, who are deemed to need no such special licence from authority.

It is true that Dr. Stevenson, F.R.C.P., might have taken the same course as that to which Mr. Lister felt himself compelled, in this predicament, and have crossed over to France or Holland to perform the necessary vivisection. 'A great delay was necessarily caused before the gentlemen engaged in the case were allowed to experiment upon animals. The delay was so serious that one gentleman in the case had determined to go to France in order that he might there make the experiments necessary upon animals without infringing the laws of the country.'³ In the case in point, on the requisition of the judicial authority, the accomplished physiologist and chemist

¹ See *ante*, p. 5.

² 'Afternoon with the Gun-club,' *Daily News*, March 20, 1882.

³ Sir William Jenner, Bart. M.D., 'Report of a Meeting at the Royal College of Physicians, March 28, 1882,' in *Daily News* of March 29.

accepted the sanction of the 'Home Office.' It is in evidence that thus the course of the 'inquest' was delayed some days before the requisite experiments could be carried out and the analyses performed. If the conditions made peremptory by the 'Society's' recommended 'Act of Parliament' had been fulfilled, the required results could not have been had. The previous narcotisation would have rendered nugatory the phenomena experimented for.

What, however, here concerns one pleading the cause of humanity is, that the check which vivisection thus puts to the perpetration of murder by poison may ultimately be made of none effect through a charge from the 'Bench' to the 'Jury,' warning them to pay no attention to the experimenter's evidence so far as relates to the symptoms of poisoning in the brute experimented upon: no less an authority than the Chief Justice of England himself having decided that—'Experiments on animals were suggestive only, not conclusive, as to the human subject. Especially is this

the case with poisons, some of the deadliest of which do not appreciably affect some animals, and as to all of which it is admitted that it is not safe to argue from their effects on animals to their effects on man.' ¹

There remains, indeed, one condition of the Humanitarian's reliance in last resort—on the judgment, namely, of twelve plain, honest men in a box; they might, with a stubborn common sense, call in question such 'dictum' from the Bench; or, at least, ask to see the 'Act' or other grounds for it. To be sure, manifesting such unwelcome independence, they might be 'discharged,' with a display of temper recalling the worst periods of judicial over-bearing in 'trials by jury.' ²

But the 'society' over which the Lord Chief Justice presides exercises a more direct

¹ *Fortnightly Review*, February 1, 1882, p. 230.

² The counsel for the poisoner is reported as quoting from high judicial authority; but the Humanitarian must be grateful to the 'Solicitor-General' for his expressed opinion: 'We may take Lord Coleridge's opinion on a point of law' (although a jury has hesitated), 'but not in a case like this.' 'I shall certainly object to non-medical opinions being read unless you call Lord Coleridge.'—'Report of Lamson's Trial' in *Daily Papers* of the date March 13, 1882.

and peremptory power in 'putting down' vivisectors than by ignorant assertions and unseemly abuse. The conditions made indispensable by the 'society's' 'Act of Parliament' would have precluded those essential to the results looked for by Drs. Dupré and Stevenson; it does not appear, at least, that they had the permission of Government to omit the condition-precedent of narcotisation in any of the instances of the beasts on which they experimented. A hostile outsider might have reported that omission.

18. *Prosecution of, and excitements to mob, Physiologists.*—Dr. Stevenson, at least, might have been summoned to Bow Street—indeed may still be—and three or more learned counsel, including the Hon. Bernard Coleridge, may be subsidised by the 'Society' to make an application to the sitting magistrate against him, under the 'Vivisection Act,' on behalf of the 'Society for the Suppression of Vivisection,' and on the plea that, 'though the vivisector now before the Bench may have been licensed to operate on a living animal, yet 'such animal must be under the

influence of an anæsthetic, which must be applied during the whole of the experiment; or else at the close of it the animal must be killed ;'—which conditions the Doctor failed to fulfil, and deliberately set at nought an ' Act of Parliament which has passed through both Houses and has the sanction of the Crown.'

Now, in perusing the above, any one interested in physiological or other natural science, in America, or in Europe, with competent knowledge of English language and literature—perhaps, even, some of my own countrymen and countrywomen—may suppose that I have plagiarised Jonathan Swift's method of exposing senseless abuses of administrative powers in his day, and that I have invented a case exaggerating the unwisdom of authority.

I, however, conclude, as I began, by quoting the following from trustworthy journals, possessing the merited confidence of their readers in the exactitude of the 'reports' in the columns headed 'Police Intelligence.'¹

¹ Date of November 4, 1881.

'POLICE INTELLIGENCE.

'BOW STREET.—An application was made to Sir James Ingham for a summons against Professor Ferrier, of King's College, under the Vivisection Act.—Mr. Waddy, Q.C., Mr. Besley, and the Hon. Bernard Coleridge appeared in support of the application.—Mr. Waddy, in making the application, said he did so on behalf of the Society for the Suppression of Vivisection. The Act upon which he proceeded was cited as the 39 and 40 of Vict. chap. 77. Mr. Waddy then cited the clauses in the Act upon which he grounded his application. Professor Ferrier was lecturer on forensic medicine at King's College Hospital, and the 3rd clause of the Act stated that before any one could operate upon a living animal he must be licensed, and the animal must be under the influence of an anæsthetic, which was to be applied during the whole of the experiment, or else at the close the animal must be killed. It would, he thought, be monstrous to let an animal go about deprived of one or two of its legs. Mr. Besley, however, contended that the first thing a scientific man had to do was to get a licence to perform operations ; and in this case he knew that the clause of the Act had not been complied with, as no application had been made to the Home Office. After this it was provided in the Act that when it was in the interests of science necessary to

keep the animal operated upon, the application had to be made for a certificate for that purpose. This had not, in the case he was about to cite, been complied with. The Hon. Mr. Coleridge then proceeded to read the report of a meeting which took place in August last, and upon which the present application was founded. It stated as follows: "The interest attaching to the discussion on localisation was greatly enhanced by the fact that Professor Goltz had brought one of his dogs from Strasburg. Professor Ferrier was willing to exhibit two monkeys which he had operated upon some months previously, and in one of which he had procured definite motor paralysis, and in the other permanent and absolute deafness. At a meeting at King's College the dog was exhibited, and saving some clumsiness in movement, the dog showed little which would distinguish it from the normal. In contrast to the dogs were two monkeys, exhibited by Professor Ferrier. One of them had been operated on in January, the left motor area having been destroyed. The result of the operation was right-sided hemiplegia, with conjugate deviation of eyes and of head. Facial paralysis was at first well marked, but ceased after a fortnight. From the first there had been paralysis of the right leg, though the animal was able to lift it up. The arm it had never been able to use. Lately rigidity of the muscles of the paralysed limbs had been coming on. The other

monkey, as a consequence of paralysis of its auditory centres, was apparently entirely unaffected by loud noises, as by the firing of percussion caps in close proximity to its head."—Mr. Waddy said that under those circumstances, he would ask for the summons, as Professor Ferrier had no licence to experiment on the animals, and no certificate to keep them afterwards.—Sir J. Ingham : What is the penalty ?—Mr. Coleridge : The penalty is 50*l.*—The summons was then granted, returnable in a fortnight.'

'The accounts of the Victoria Street Society (the Vice-President of the Board of Trade being treasurer of the funds) are open to all the world, and published annually, audited by a professional accountant.'¹

In those issued to 'subscribers' for the year 1881 the amount paid in fees to the three learned counsel instructed by the 'Society' to insure the conviction of Professor Ferrier is not entered: the only item in relation to such expenditure would appear to be included under the head of 'Miscellaneous Expenses' 142*l.* 1*s.* 4*d.* (p. 7 of 'Report').

¹ Frances Power Cobbe, 'Vivisection: Four Replies,' p. 101, *Fortnightly Review*, January 1, 1882.

Neither, in preceding 'Annual Statements of Accounts,' including expenditures, in the year 1877, is there an entry of the sum spent in relation to the following action of the 'Society' recorded in their 'Minutes' under the head of 'Chronology of the Antivivisection Movement.' It is as follows :—
 '1877, February 7, Committee of Victoria Street Society resolved to support Mr. Holt's Bill, and ISSUED ILLUSTRATED PLACARDS AND HANDBILLS OVER LONDON FOR SUCH PURPOSE' (see *ante*, p. 2).

